Information and Communication Technology

A-D-D-I-E Model

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INTRODUCTION: -

While teaching the class XI Chemistry Chapter “Some basic concepts of chemistry”, the teacher observed that students can theoretically explain the concept of Molarity and solve textbook numerical problems, but they find it hard to use this knowledge in calculating the molarity of a solution by Titration, i.e., measuring solutes, preparing solutions, handling volumetric apparatus and achieving the required concentration consistently.

So, the teacher uses an ADDIE model to counter this problem, in which he first Analyze the Performance gap, leaner and context in which learning is taking place, Design learning objectives/instructional goals, Develop relevant learning materials, decides delivery of the learning resources and also the Evaluation criteria. He also aligns Flipped Classroom strategy, since it is well established that students have access to google classroom at home and access to learning materials is convenient also.

ANALYSE STAGE: -

1) Current State :-

Students are able to understand and explain the theoretical meaning of molarity concept, are able to solve numerical problems also with a clear understanding ing of relation between mole, mass and volume.

2) Desired State :-

Students should be able to prepare a solution of required volume along with required mass of solute and solvent with desired concentrations, they should be able to translate numerical calculations into physical measurements with precise accuracy.

Performance Gap :-

It is identified that there is a gap between student’s theoretical understanding of molarity and their ability to independently apply that knowledge during lab preparations with accuracy.

Probable Causes :-

Lack of hands-on experience - they may not have the opportunity to prepare solutions on their own and use the lab equipment.

Gap between theory and practice - although they know what molarity is in terms of the formula they may struggle to apply it.

They may make errors when weighing, measuring the meniscus, measuring volumes and transferring.

Some students may struggle applying the concepts of moles, molar mass, volume and molarity.

They may not be confident using the lab equipment due to lack of practice or fear of making mistakes. They also may not have enough time to practise the full process and correct their mistakes.

Purpose Statement: The Purpose of this lesson is to enable students of class XI chemistry to have an understanding on how to apply their knowledge of molarity and mole concept practically to identify the Molarity of a given solution through Titration.

Learner Analysis :-

{Done by a thorough survey attended by the class XI Chemistry students}

Target Group: - Class XI Chemistry students

Previous knowledge: - Basic knowledge of Atoms, Molecules, atomic mass, volume, and mole concept.

Learning difficulties: - finds it hard to translate numerical calculations into practical laboratory procedures.

Students are familiar with molarity and its mathematical representation and they majorly preferred Visual demonstrations, hands on experiences along with interactive content for learning methods

Context Analysis :-

Core concepts contain Molarity, mole concept, mass volume relationship, concentration.

However, the Practical application requires Preparation of standard solutions, weighing, dissolution, and proper mixing of different solutes and solvents for desired solution.

Thus, it establishes that fact that clear understanding of core concepts is required for successful laboratory performance.

Students have access to Digital learning environment (decent mobile/laptop availability along with internet connectivity), in fact, Google classroom is already an existing edtech tool between instructor and students.

Lab is fully equipped and well maintained however had limited laboratory time and apparatus constraints.

Thus, concluding this stage we get the basis of our **Instructional Goals**, i.e., explaining relationship between molarity and mole concept along with identifying the Molarity of a given solution through Titration using appropriate lab apparatus for solution preparation and demonstration of correct procedure for preparing it. It is required that by end of lesson students are able to independently do Titration and find the Molarity of any solution with considerable accuracy.

DESIGN STAGE: -

Learning objectives: -

(i) Students will be able to explain the relationship between mole concept, mass and molarity and how these concepts determine the concentration of solution with at least 90 % accuracy

(ii) Students will be able to calculate the required mass of solute for a specified molarity with 90% accuracy and also to identify potential errors in lab procedures affecting desired accuracy.

(iii) Students will be able to independently do Titration between an Acid and a Base using appropriate laboratory apparatus and find the molarity of the HCl solution with 90% accuracy.

Now, given our determined learning objective s and instructional goals, we ought to CONSTRUCTIVELY ALIGN the Learning activities and Assessments task with it.

Learning Activities: -

(i) Edpuzzle video to clear basic understanding and resurface all the misconceptions and doubts.

(ii) Concept based instruction for encountering those misconceptions and doubts.

(iii) Showing the explanatory video in laboratory, providing a well-informed demonstration for students to observe and learn under instructor's supervision.

(iv) Students thus now will prepare the solution in and develop their practical competency.

(v) In last, a Predict Observe Explain activity for a 5-minute quiz to tackle any residual doubts.

Assessment: -

(i) Edpuzzle questions as a formative assessment to measure basic conceptual understanding. (Non-Graded)

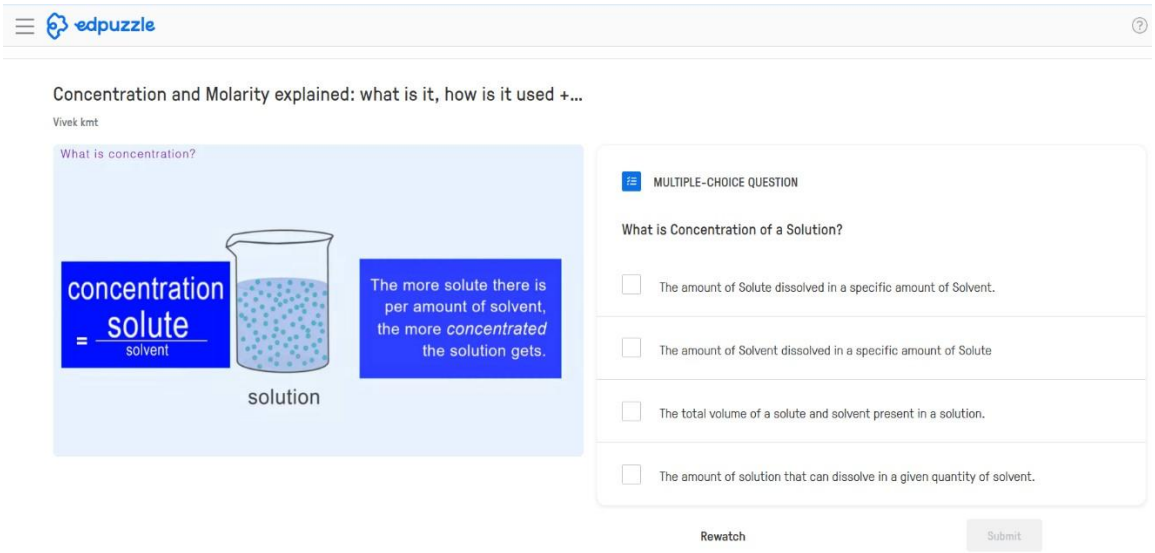
(ii) Laboratory Performance rubric for checking the ability of students to prepare the solution. (Graded)

(iii) A written quiz in next class to check overall conceptual learning. (Graded)

After making sure that the concept is now well addressed and much of the misconceptions/doubts are reduced and overall understanding increased, the instructor moves to next topic.

DEVELOP STAGE: -

1) ***Edpuzzle video***: -
A good video first has been imported from YouTube, making sure it targets all important concepts, then carefully 3 MCQs were put into it, the video taken was somehow 5 minutes, so that students don't get much cognitive load while answering the basic conceptual questions.



2) Explanatory video: -

Prepared by Instructor himself for providing an easy demonstration for preparing the required solution and finding out its molarity with minimum errors. Contains descriptive narration + images of the apparatus/topics involved to reduce both extraneous and intrinsic load. Made by using the edtech tool **"ChemCollective"**.

3) Quiz using **google forms/Storyline360**: -
   Prepared for the purpose of POE activity in classroom to resurface doubts and tackle them, thus, non-graded and only meant to be displayed by instructor on big screen for interactive engagement.

4) Written Quiz worksheet: -

   Prepared for checking overall conceptual understanding so far, will be announced earlier so that students can prepare accordingly, graded and is part of continuous evaluation.

5) Miro storyboard: -
   It is used primarily by instructor only, helping him/her to design and structure the whole learning strategy from needs/objectives to assessment/evaluation.

{NOTE: - ALL THESE MATERIALS ARE SHARED ALONG WITH REPORT IN THE ZIP FOLDER}

IMPLEMENT STAGE: -

As an instructor, we will use Flipped classroom model in this lesson plan to make sure we address every aspect in concept making and efficient learning process.

(i) **Before Classroom**: - A Feedback Form (learner survey) will be shared via google forms to identify learning needs and prior knowledge.
Based on which an Interactive Edpuzzle video will be shared to introduce theoretical concepts and resurface common misconceptions and doubts. [*Non – Graded*]

(ii) **During Classroom {Chemistry Lab}**: -
Concept instruction and doubt solving {10 minutes}
Video presentation and live demonstration {10 minutes}
Supervised student practice and Practical Assessment based on lab rubric {30 minutes} [*Graded*]
Quiz for Predict Observe Explain Activity for countering residual doubts and misconceptions. {5+ minutes}

(iii) **Next Classroom**: - Supporting learning material will be shared through Google classroom for sharpening conceptual foundation, as it will be followed by Comprehensive written quiz for overall conceptual understanding. {10 minutes} [*Graded*]

EVALUATION: -

To check whether our instructional strategy managed to addressed students doubts and actually succeeded in improving understanding, implementation of the topic, we will use the following measures,

(i) *Instructional effectiveness*: - it can be evaluated by effectiveness of videos, Edpuzzle and demonstrations, hands-on learning under instructor's supervisor. Evidence- Student feedbacks and observations.

(ii) *Learner understanding*: - Conceptual understanding of molarity and relevant topics will be evaluated by Written quiz.

(iii) *Practical Assessment*: - It is here the ability of students to prepare a solution accurately and, measure precise molarity will be tested. This evaluation will be done by a comprehensive Practical rubric.

PRACTICAL RUBRIC-

CRITERIA	MARKS
Correct mass calculation	2
Appropriate apparatus selection and handling	1
Accurate weighing	2
Mixing and labelling	1
Proper dissolution and transfer	1
Accurate final Molarity-Volume adjustment	3

(iv) *Limitations and improvements*: - Now it is well known, that there will still be some students who will skip feedback form and Edpuzzle video, they will be notified before class day once again specifically to watch the compulsory video and answer the feedback form. The students who will still face problems in lab practicals after demonstration will be paired with helping students and under instructor's special supervision.

All the Assessments and activity will be graded under continuous evaluation policy. Here, in this lesson plan, these are 2 formative assessments {Edpuzzle (non-graded) and lab Practical} and 1 summative assessment {Written quiz}.

Hence, the Overall achievement of intended learning objectives by help of various learning activities can be evaluated with the help of combined assessment results.