



Erasmus+ Programme
Strategic Partnership for School Education
AGREEMENT n. 2017-1-IT02-KA201-036948
CUP: H89D17001200006
FLIP2LEARN – F2L
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Project of a Flipped Learning Unit

Subject:
Chemistry

Class:
II year of Informatics and Telecommunications Course

TOPIC:
The pH in everyday life

Number of hours:
seven

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A FLIPPED LEARNING UNIT PROJECT

Subject:	Chemistry
Title:	PH in everyday life
School:	ITET "G.Caruso" - Alcamo
Teacher:	prof.ssa Duca Vincenza Maria
Class:	II year of Informatics and Telecommunications Course

1	<p>The challenge consists of three questions:</p> <p>What is pH? What is meant by neutral, acidic or basic pH? How to measure it?</p> <p>Prerequisites:</p> <p>Nomenclature and formula of compounds, Chemical equilibrium; molarity Before starting the teaching unit, a review of the topics will be proposed through an active lesson followed by guided exercises carried out in peer groups. During this teaching unit many tools such as: Padlet, website, video lesson, augmented virtual reality, e-book, multimedia material will be used.</p>
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2	TEACHING UNIT AIMS
<p>The aim of the teaching unit is showing how the acids and bases are part of our everyday life and are relevant for our health and the environment. The students will learn to identify and distinguish them and carefully analyzing their behavior.</p>	

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DESCRIPTORS DEFINING THE LEVELS		
KNOWLEDGE	ABILITIES	SKILLS
<ul style="list-style-type: none"> ▪ Explain the behavior of acids and bases, using the Brönsted and Lowry theory ▪ know the concept of pH ▪ know the pH scale ▪ know the ionic product of water ▪ Know the indicators ▪ Know the pH meter 	<ul style="list-style-type: none"> ▪ Perform simple calculations to determine the concentrations of H⁺ and OH⁻ ions and of the pH of strong and weak acids and bases ▪ Know how to use a pH meter ▪ Determine the pH with indicators and universal indicator papers ▪ Understand that so many common products have an acid or basic behavior 	<p>Key skills:</p> <ul style="list-style-type: none"> ▪ communication in the mother tongue ▪ mathematical competence and basic skills in science and technology ▪ digital competence ▪ learn to learn ▪ social and civic competences ▪ Initiative and entrepreneurship ▪ awareness and cultural expression <p>Disciplinary skills:</p> <ul style="list-style-type: none"> ▪ evaluate whether a substance is acidic or basic from the pH value ▪ carry out surveys and documentation, using knowledge, skills and skills acquired appropriately ▪ understand the importance of the pH value of everyday substances in safeguarding human health and the environment.

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TOOLS, INSTRUMENTS AND LABS

INSTRUMENTS AND TOOLS	LABS
E-book	Chemistry lab
Multimedia products: video, increased virtual reality, padlet	Virtual reality lab
IWB (Interactive White Board)	Computer lab
White board	Tablet or mobile phone

TESTS TYPOLOGY

Oral tests	Closed-ended questions
Written tests	Open-ended questions
Chemistry lab experiments	Laboratory report
Personal or group research	

METHODOLOGIES

Methodologies:

The teaching methods used consist of active lessons and innovative digital lessons, flipped classroom, soft skills, laboratory teaching.

The challenge is: how to activate the students' interest and motivation: Stimulate interest, curiosity and involve students in order to make them an active part in the construction of the indicated knowledge. Typically, this happens by launching a challenge that may consist of asking a question to be answered, a problem to be solved, a research to be carried out, a case to be analyzed in an engaging and motivating way. In this teaching unit we start by showing a video at home.

The activity in the classroom includes three phases where both the teacher and the pupils carry out certain activities, such as:

Experience Phase, Production Phase, Processing Phase.

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CLASSROOM ACTIVITIES

EXPERIENCE PHASE

What does the teacher do?

1st activity

The teacher using the IWB, recalls the topics related to the prerequisites and through a participated discussion and guided exercises ensures the acquisition of these by the students.

2nd activity

The teacher launches the challenge and, through Padlet, he/she notes on the virtual wall the answers of the students to the questions related to the challenge

3rd activity

The teacher asks the students to go to his/her website to see the video concerning the method of the flipped classroom, the video lesson and, moreover, asks them to carry out the activities they will find on the same page of the site.

The following day the teacher will answer the questions of the students and he/she will insert them on Padlet and will also show the e-book telling the students what they will have to study.

What do the students do?

1st activity

They take an active role during the lesson, the review and the guided exercises

2nd activity

They answer the questions asked by the teacher about the challenge

3rd activity

They watch the video at home and do the suggested activities that will be then developed in the classroom.

They study the e-book and individual exercises related to the calculation of pH that will be corrected and not evaluated by the teacher

PRODUCTION PHASE

(PH measurements)

What does the teacher do?

- Prepares the laboratory materials and gives instructions about the activity.
- Watches over the pupils, noting their behavior;
- Provides the material to consult and / or study necessary for the performance of the activities

What do the students do?

1st activity

Divided into groups of 2 members, the pupils carry out the practical lab activity which consists of two phases.

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PROCESSING PHASE

(products to be implemented, comparison strategies, evaluation activities.)

What does the teacher do?

- Asks questions, provides digital material to produce products and columns for evaluation. Guides and supports the students
- Uploads the students works on padlet
- At the end submits the objective summative test

What do the students do?

1 Activity

In groups of 2 components, through the digital material provided by the teacher, they reflect and discuss giving the answer to the questions asked by the teacher and write the report.

They socialize their works and evaluate themselves.

Tools used during the teaching activity

Padlet, video lesson, e-book, increased virtual reality

DESCRIPTION OF THE TEACHING UNIT DEVELOPMENT

Work at home

The students are invited to visit the teacher's website where they can see, first a video about the flipped classroom and, later, the video, made by the teacher, about the lesson with the activities to be performed after the vision

<https://sites.google.com/site/ducacapovolta/home>

<https://sites.google.com/site/ducacapovolta/la-mia-classe/lezione-capovolta>

First hour of lesson

Work in the classroom

Using Padlet the questions raised by the video will be written down there, so that the teacher can give explanations.

The students will do the self-assessment test.

(see Socratic test evaluation grid)

Presentation of the e-book and its use during the teaching unit.

Indications of the topics to study at home

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Second hour of lesson

Chemistry lab activities

The groups, established by the teacher, are published on the site.

Each group will find different substances for daily use at their station on the desk: household substances, food, organic substances, different types of commercial mineral waters which they will use to determine their degree of acidity.

What is needed

Equipment: test tubes and test tube holders; squeeze bottle; beaker, graduated cylinder, glass rod, pH meter

Reagents: Indicators; universal litmus papers; substances of common use

How to do it

Perform the measurement of pH, using an indicator and universal indicator papers (augmented virtual reality)

For pH measurements through indicators and universal indicator paper:

1. Pour a few milliliters of each type of substance into different beakers or tubes (if the material is solid it is necessary to dissolve it in a little water)
2. Pour the first indicator into each beaker
3. Write down the color change of the solution
4. Write down the result.
5. Repeat the same operations using the second indicator
6. Repeat the same operations using universal indicator maps.

Third hour of lesson

Chemistry lab activities

Perform the measurements through the pH meter, taking care to calibrate it, use first a pH 7 buffer solution and then a pH 14 buffer solution

(for more information on the pH meter consult the e-book)

To carry out the measurements, you should always wash and dry the electrode and immerse it in the beakers where you have already poured the liquid substances or, if solid, solubilized with distilled water.

Record the pH value of each substance.

Fourth hour of lesson

Computer lab activities

After you have carried out all the measurements, using EXCEL, create a table with 5 columns and write down the results of the measurements performed, using a pH meter, in the following way: in the first insert the name of the substance, in the second the pH value, in the third

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the molar concentration of the ions H^+ , in the fourth the molar concentration of the OH^- ions and, finally, in the fifth column determine if the substance is acidic, basic or neutral. As for the measurements made with the indicators, make a table with 5 columns and report the measures as follows: in the first insert the name of the substance, in the second and third column the name of the indicator added, in the fourth column the color taken from the solution by adding the universal indicator paper and finally in the fifth column determine whether the substance is acidic, basic or neutral.

Fifth hour of lesson

Work in the classroom

Now, in group, let's think about the experience.

What is the main difference between a measurement carried out by means of indicators, a universal indicator paper and a measurement performed by means of a pH meter?

Write a short answer of two lines.

At this point, look for information on the web about the pH of mineral and drinking water and, based on the values obtained on the samples that have been analyzed, prepare a short 5-line report illustrating the properties and contraindications in the use of these waters, considering that they can be taken by a newborn, by a person suffering from gastritis, by a person who has digestive problems, by an adult.

Recommended site:

books.google.com/books?Id=EolbpqxyoloC&pg=PA47&lpg=PA47&dq=use+of+waters+minerals+a+pH+acid&source=bl&ots=R1hm-jUjQq&sig=

The answers and the reports will be written on the padlet board

Sixth hour of lesson

Work in the classroom

Socialize with the classmates the work produced through the presentation of the answers and the report and any questions that may arise.

Self-assessment of the activity, according to the following checklist

Indicators	no	partly	yes
1. Did I actively collaborate with the group?			
2. Are the results consistent?			
3. Did I answer appropriately to the questions asked by my classmates?			

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4. Are the report and the answer to the question clear and do they satisfy the requests?			
5. Did I use a specific language?			

Seventh hour of lesson

Work in the classroom

The students, divided according to the laboratory work groups, prepare the report on laboratory activities (40 minutes).

Evaluation between peer

The groups exchange the reports and evaluate them through the following evaluation form (20 minutes).

Checklist

Indicators	no	partly	yes
The report is complete			
The schematization through the data tables clearly shows the results			
The problem has been understood			
The language used makes use of technical-scientific terms			
The goal has been reached			

Descriptive procedure to make video

<https://www.youtube.com/watch?v=4tqXljgsc1E>

Descriptive procedure for the creation of the E-Book

Descriptive procedure for the creation of the E-Book

Descriptive procedure for the realization of augmented virtual reality

Descriptive procedure for the realization of augmented virtual reality

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Summing up (multiple choice test)

EVALUATION OF LEARNING

Authentic assessment, which reflects the experiences of real and worthy learning, can be documented through observation, fact records, through evaluation rubrics (forms) (examples of evaluation rubrics are attached here).

The formative evaluation will consider: active participation during group work; how the pupils relate to each other and with the teacher; the work they managed to produce; the answers given to the guide questions that had been given as homework before starting the actual activity.

The summative assessment will consider: the knowledge, skills and abilities acquired on the subject; the type of autonomy; to be able to relate clearly and to use a scientific language in the presentation of the topic; to be familiar with the information technology used. (Attached evaluation sheets).

EVALUATION FORM - SUMMATIVE STRUCTURED TEST

ITEM	POINTS	AIMS
TRUE/FALSE	0.1 points	It allows to verify the acquisition of acquired knowledge
CLOSED ENDED QUESTIONS	0.5 points	It allows to verify the acquisition of knowledge, even more complex, and objectives of understanding and application

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KNOWLEDGE AND ABILITIES GENERAL ASSESSMENT FORM

MARK	KNOWLEDGE	ABILITIES
1	Not expressed	Not observed
2	Very poor	Unable to apply very poor knowledge
3	Poor	Unable to apply poor knowledge under guidance Expresses him/herself incorrectly and not properly
4	Incomplete	Apply minimum knowledge if under guidance, making mistakes. Expresses him/herself not properly
5	Unsatisfactory	Apply knowledge imperfectly. Expresses him/herself inaccurately. Carry out incomplete analyses.
6	Satisfactory as to minimum aims, but not detailed	Apply knowledge rather correctly. Express him/herself in a simple but correct way. Able to single out basic elements and relate them.
7	Fundamental contents ac- quired, with some cross-links and interdisciplinary refer- ences	Autonomous in applying knowledge, even on complex problems, but not always accurately. Explain corretly with proper language. Carry out coherent analyses.
8	Fundamental contents ac- quired, with supplementary cross-links and interdiscipli- nary references	Autonomous in applying knowledge, even on complex problems. Explain with proper language and carry out cor- rect analyses.
9	Systematic, structured, with autonomous in-depth anal- yses	Apply knowledge correctly and autonomously, even on complex problems. Explain fluently using appropriate language. Carry out deep analyses and single out detailed connections.
10	Systematic, deep and wide	Apply knowledge correctly and autonomously, even on complex problems. self-management in finding better solutions. Ex- plain fluently, using rich and appropriate lan- guage.

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EVALUATION FORM TEST SOCRATIVE

ITEM	POINTS
True/false Items N.1-2	0.5 points
Close-ended question Item n.3	1 point
Problem solving Items n.4-5-6	2 points (if done correctly) Procedure error (-80% of the score attributed to the exercise) Calculation error (- 50% of the score attributed to the exercise) Exercise not performed (score 0)
Open-ended question Item n.7	2 points (exhaustive knowledge and accurate processing) 1 point (partial knowledge and adequate processing) 0.5 (incomplete knowledge and not completely elaborated processing) 0 (lack of response)

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EVALUATION FORM (RUBRIC)

SKILL	CRITERIA EVIDENCE	LEVELS OF MASTERY	LEVELS DESCRIPTORS
Learn to learn	Ask relevant questions Apply study strategies	full	Apply study strategies and re-elaborate texts organizing them in simple schemes, steps, summaries; connects information already held with the new-ones from different sources. Use various consultation tools independently
		adequate	Can derive and select simple information from different sources: books, Internet ...) for his/her own purposes, under the supervision of the teacher. Use simple strategies to organize and memorize a text he/she has read: can do diagrams with the help of the teacher. Can formulate written summaries of texts that are not too complex and can make connections between new information and those already possessed, with the help of the teacher. Apply, with the help of the teacher, study strategies
		Partial	Partially derives information from reading simple tables with the help of the teacher and of the peers. He/she cannot apply study strategies

SKILL	EVIDENCE CRITERIA	LEVELS OF MASTERY	LEVEL DESCRIPTORS
Ability to collaborate in the group	Responsibility and willingness to collaborate with peers and adults	full	Collaborate actively and responsibly in the group; is supportive, respectful and listens to others
		adequate	He/she is quite collaborative and responsible towards the group; he/she does not always show solidarity and respect towards the group
		partial	He/she has a passive and not always responsible atti-

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			tude towards the group.
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SKILL	EVIDENCE CRITERIA	LEVELS OF MASTERY	LEVEL DESCRIPTORS
Interaction within the group	Positive interdependence	full	He/she knows how to use social skills for a successful group collaboration
		adequate	He/she uses some social skills for a successful group collaboration
		Partial	He/she uses with difficulty the social skills for a successful collaboration of the group

SKILL	EVIDENCE CRITERIA	LEVELS OF MASTERY	LEVEL DESCRIPTORS
Answer to the problem	Interest and participation in solving the problem	full	Full interest and full participation in the proposed work
		adequate	Good participation and interest in the work if stimulated by the classmates and / or the teacher
		partial	Insufficient and disinterested participation

SKILL	EVIDENCE CRITERIA	LEVELS OF MASTERY	LEVEL DESCRIPTORS
Self evaluation	Objective ability to evaluate one's work	full	The student is able to correctly evaluate his/her work and can make the necessary corrections
		adequate	The student sufficiently knows how to evaluate his work and correct the errors
		partial	The student can hardly evaluate his work

SKILL	EVIDENCE CRITERIA	LEVELS OF MASTERY	LEVEL DESCRIPTORS
Give answers	Ability to be clear and	full	The student is able to answer questions, to be clear and deep

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	deep	adequate	The student, if guided, can give explanations
		partial	The student, guided by the teacher, can hardly answer the questions

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Final reflection. How the proposed approach differs from its traditional approach? (Indicate the advantages of the chosen approach compared to the traditional approach and highlight the differences with reference to the chosen curriculum topic.)

Conclusion

I chose the flipped classroom method because, for the overturning of the two central didactic moments of the school and for its flexibility, it allows an organization of time and forms of teaching closer to the modalities and rhythms of learning of the students.

One of the fundamental aspects of this flexibility concerns the way to organize the time and the forms of teaching to make them closer to the transformations of the cognitive scenarios due to the introduction of the new media.

This methodology is an opportunity for concrete organizational and methodological innovation, as it allows to redefine teaching spaces and times and to promote teaching based on research and doing, rather than on the traditional lesson.

The flipped classroom method leads us to reconsider times and ways of learning and move from a school model based on formal learning to a learning based on tasks and projects to be implemented, in which the pupil acts as a protagonist in a concrete, meaningful and collaborative dimension.

This method finds its natural expression in the laboratory teaching.

In fact, in the laboratory, the logic of the re-production of knowledge is abandoned and is replaced by reconstruction and re-invention of knowledge

The laboratory is a learning situation in which the knowledge and skills, cognitive and social, emotional and affective aspects, planning and operation are effectively integrated: it remains the privileged "place" for the practice of didactic personalization.

The laboratory can be considered the metaphor of how all learning should take place: a space in which to experience with others, where they learn to use procedures, materials, methods that stimulate real learning processes and promote the "construction" of knowledge.

The flipped classroom, allows:

- to create learning situations that favor the construction of knowledge and not its reproduction;
- to use motivational and emotional factors in the best possible way
- to present authentic tasks;
- multiple representations of reality;
- improve reflection and reasoning;
- improve the cooperative construction of knowledge.

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- the exploitation of the error
- the use of more stimulating innovative digital methods

The function of the teacher becomes that of "facilitator" of the processes of constructing knowledge, of promoting opportunities for learning. He/she encourages the students to express themselves.

The student dominates the meaning of his learning, because he produces, because he works concretely, because "doing" knows where he wants to go and why.

The flipped classroom method has as its objective the inclusion in the learning process of pupils with special educational needs and stimulates their autonomy. This strategy allows to overcome the organizational form of the group-class, in learning environments more responsive to the training needs of pupils in difficulty, enhances the skills possessed in a participated construction path and lays the foundations for a personalized teaching to favor inclusion processes.

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