Worksheet 5.2.3
Work out a real Project

III. Work on Investigation stage

Activity 1 **75 minutes**

Study now the description of the third stage (Investigation Stage) of the project and carry out all the activities described in the corresponding worksheets (Worksheet 7, Worksheet 8).

Activity 2 **15 minutes**

At the end of the Activity 1 discuss in your group the following issues:

1. What kind of difficulties may a teacher face during the implementation of this stage?
2. What kind of difficulties may the students face during these activities?
3. Complete the following table with activities that may be included in the Investigation Stage.

Be prepared to share your thoughts with the rest of the class.

Investigation Stage

Stage	Teaching Strategies-Tools	Students activities	Teacher activities
Investigation Stage			

Description of the Project
Setting a Bus in Motion

Investigation Stage

3-4 hours

At this stage, the learners are asked to determine anew the problem which they worked on during the second teaching hour in the light of the experience they gained with the materials and the software and to formulate a solution.

After the end of this unit, the pupils will be able:

- ✓ to express questions and direct their research independently;
- ✓ to design, materialize and evaluate a structural work;
- ✓ to design, materialize and evaluate a programming solution.

Seventh Teaching Hour

Learners re-examine their original problem on the basis of the scenario presented during the second teaching hour (Worksheet 7)

They determine the structural characteristics which the bus model they will construct must have, as well as the functions it must perform. A circuit upon which testing by the teams will be performed is essential to be constructed in the area where the pupils will be working.

The teacher may discuss with the learners the criteria whereupon they will evaluate their structural work. These may be:

Criterion	**4**	**3**	**2**	**1**
Does it work as I originally planned?				
Does it always work?				
Can it be reused many times?				
Is it easy to use?				
Is it easy to construct?				
Is it safe to use?				

The list can be completed by the class. This list must stay within the class on a notice board so that everyone can consult it.

Eighth – Tenth Teaching Hours

Through the description of the functions that took place in Lesson 7, the class teams undertake to study a question each.

Examples of subjects for research which will pre-occupy the pupils are shown below:

- A study on the way in which the bus can turn.
- A study on stopping and waiting for passengers as well as selective stopping depending on whether there are passengers at the stop.
- Means by which it can serve disabled people while it is stopping etc. (e.g. sound)
- How it parks and how it starts off at the terminus.
- How it will move on a pre-defined track.
- How to deal with situations of danger/obstruction.

The learners are directed in their exploration through Worksheet 8. At the end of each teaching hour, the learners record, for five to seven minutes, notable events which occurred during the course of their lesson. We ask of them to record the individual problems which they faced, what they tried, how they evaluate the results. The learners, at the end of this unit, can present to the rest of their peers the results of their work, in other words, their suggested solution. These projects can be printed out alongside interpretative comments and be mounted on the notice boards of the class room for the duration of this activity.

Name…….Date…… …….

Setting a Bus in Motion

Worksheet: Construction of the bus

In the light of the experience acquired, study again the scenario.

You work for your Municipality in the transport sector. The downtown area is facing very serious traffic problems, especially when the shops are open. The downtown area is going to be pedestrianized and private cars are to be banned during shopping hours. The transportation of the residents will be effected by programmed buses which will be run without a driver.

As a team, you are asked to write down in the following list the structural features that such a bus should have or the functions that it should perform in order to be in a position to serve the needs of the residents. Bear in mind that your town is to become famous by this original means of transport!

Subsequently, share your thoughts with the rest of the class and complete your list if necessary.

Structural features	Behavior:

Which are the criteria whereby you would evaluate a structure? Write down your criteria in the table given below. Then, configure a criteria list working jointly with the rest of the class.

Criteria

Based on the structural features that you have defined above, construct a bus in the light of what you have so far learned.

Describe the car that you have constructed.

How is motion transferred from the motor?

Which are the difficulties you encountered?

What experiments have you carried out?

How do you evaluate your car in the light of the criteria you have defined above?

Name…….Date…… …….

Setting a Bus in Motion

Worksheet: Suggest a solution

1. State clearly the problem which you will be trying to solve:

2. Write down ideas that can be utilized in its solution.

3. Use your personal computer in keeping a diary of your project. Indicate :

Date:

Which problem you have tried to address?

What did you try?

How did it go?

Have you accepted or not that solution and why?

4. For the presentation of your project in class, prepare four slides. The first will include the problem/question that you researched, the second one will include the structural and functional requirements that your model had. The third slide will include the program you have created and the fourth slide will include your reflections. All the best in your presentation!!

Woeksheet 5.2.4
Work out a real Project

IV. Work on Creation stage

Activity 1 **75 minutes**

Study now the description of the forth stage (Creation Stage) of the project and carry out all the activities described in the corresponding worksheet (Worksheet 9).

Activity 2 **15 minutes**

At the end of the Activity 1 discuss in your group the following issues:

1. What kind of difficulties may a teacher face during the implementation of this stage?
2. What kind of difficulties may the students face ?
3. Complete the following table with activities that may be included in the Creation Stage.

Be prepared to share your thoughts with the rest of the class.

Creation Stage

Stage	Teaching Strategies-Tools	Students activities	Teacher activities
Creation Stage			

Description of the Project

Setting a Bus in Motion

Creation Stage **1-2 hours**

At this stage, the pupils are asked to put together creatively all the elements which they constructed until now. Targets which are served through these activities are:

- ✓ Formulation of questions and exploration (experimentation).
- ✓ Testing and evaluation of the results of exploration.
- ✓ Combination of the selected solutions.
- ✓ Justification of their choices.

The pupils record useful ideas which were suggested by their peers during the exploration both at the construction stage and the programming stage. Afterwards, they are asked to put together a complete suggestion for the robot bus which will move on a certain route. The course of their project is recorded in the diary just as it was at the previous stage. When their project is complete, they must draft a report in which they will:

- Describe the structural characteristics of the robot bus.
- Describe the functions which it can perform.
- Support their choices with arguments.
- Record the advantages and disadvantages of their proposal.

Name…….Date…….

Setting a Bus in Motion

Worksheet: Synthesize and Create

1. Create and program a robot bus which will be serving your municipality residents in accordance with the features and functions that you have written down (consult your class notice board).

2. Write down questions and ideas regarding their solution, utilizing, probably, the proposals put forward by the other teams as well. You may also consult the class notice board.

Questions	Proposed Solutions

3. Use your computer in order to continue your project diary. Indicate:
   Date:

Which problem you tried to solve?

What did you try?

How did it go?

Have you accepted or not that solution and why?

4. Draft a text supporting the solution you have proposed.

Describe the construction work.

Describe the functional capabilities that it has.

Support with arguments your choices.

Write down the advantages and disadvantages of your proposal, as well as your proposals for future improvement.

5. Prepare the presentation of your project

In order to organize effectively your research work being with:

Definition of the problem

Search for information and give ideas that will lead to the solution

Evaluation of the ideas and selection of the most suitable

Plan of the solution on paper

Materialization, testing and correction

Evaluation based on specific criteria

Description of the solution, support of your choices

Presentation

Keep in mind

When we do not know how to go on, we state clearly the question/problem that we are faced with.

When something works then we deserve acknowledgement.

We get to learn something new when something does not work.

It is worth choosing the simplest way in doing something.

If something makes sense to us, then it may make sense to other people as well.

Worksheet 5.2.5
Work out a real Project

V. Work on Evaluation stage

Activity 1 **30 minutes**

Study now the description of the last stage (Evaluation Stage) of the project.

Activity 2 **15 minutes**

At the end of the Activity 1 discuss in your group the following issues:

1. What kind of difficulties may a teacher face during this stage?
2. What kind of difficulties may the students face?
3. Complete the following table with activities that may be included in the Evaluation Stage.

Be prepared to share your thoughts with the rest of the class.

Evaluation Stage

Stage	Teaching Strategies-Tools	Students activities	Teacher activities
Evaluation Stage			

Description of the Project

Setting a Bus in Motion

Evaluation Stage

1-2 hours

At the evaluation stage the learners are asked:

- ✓ to present the results of their project;
- ✓ to justify their choices to the rest of the team;
- ✓ to utilize evaluation criteria.

Each team is asked to present their project and participate in the discussion which will be developed within the class. Suggested topics/questions which can be developed in the class are:

Regarding the suggested solution:

Effectiveness of the solution.

Stability during testing

Originality.

Simplicity.

Safety.

Regarding the procedure followed:

Did you ask questions?

Did you try more than one solution?

Did you support your solutions with arguments?

Did you make good use of the new information which was given to you?

Regarding cooperation (team work):

Did you express your ideas, opinions to the team?

Did the contribution of the rest of the team help in the completion of the project?

Were there situations where your opinion differed?

In a similar way we can give feedback to the learners that took part in the activity. An evaluation worksheet can first be completed by the learners and, subsequently, by the teacher in a different color.

Activity 3: Use the following Rubric to evaluate the project "Setting a bus in motion"

Rubric to assess a the Project

	Novice	**Apprentice**	**Practitioner**	**Expert**
Authenticity ·	content and skills are connected to later use in school only	content or skills are somewhat connected to life outside of school	content and skills are clearly connected to life outside of school, such as the work world	content and skills of task are highly relevant by connecting to students' lives right now
Open-Ended ·	task has only one correct response	task allows limited room for different approaches	task allows for different approaches based on the same content/skills base	task allows students to choose different assessment measures for the task
Complexity ·	task contains different skills, most lower order	task contains many different skills and content	task contains many different skills and content, including higher-level thinking	task contains many different skills and content, including higher-level thinking task contains opportunities for students to choose some of the skills and content
Curricular Connection	task is loosely connected to key skills and content in curriculum	task is clearly connected to key skills and content in curriculum	task is clearly connected to key skills and content in curriculum time frame and scope of task match time frame and scope in the curriculum	task is clearly connected to National Standards

6. Evaluation methodology

For the Pilot Course

Introduction

This methodology is meant for assessing the pilot course designed and implemented in the framework of the TERECoP Project on student-teachers.

The pilot courses will be implemented at IUFM (France), University of Piteşti (Romania), Rovereto (Italy) as partner-institutions in the project, with 15 student-teachers as trainees in each case, combining both face to face classes (approximately 5 training periods per week for 2 months) and e-learning classes (duration 2 months). The trainees will be encouraged to implement in a school class the new teaching methodologies learned in the course and to report on their experiences.

The methodology comprises 3 main parts:
1. An explanatory part upon the goal of the evaluation structured questionnaire and some methodical recommendations related to the:
   - structure of the questionnaire and types of questions;
   - selection criteria for the student-teachers;
   - information on how to apply the questionnaire;
2. The structured questionnaire itself;
3. Recommendations on how to process and interpret the results and on how to render the evaluation report.

A. Explanations and methodical recommendations for interviewees

► ***The goal*** of this structured questionnaire is to allow us finding out your views concerning the opportunities provided by the pilot course and its use as a medium for promoting computer-based robotic activities in the teaching repertoire as a constructivist learning tool that can support pupil/student knowledge construction, learning by doing, learning through active exploration and can increase pupil motivation in science and technology.

In addition, we would also like to know your views as to what extent the teaching / learning sequence outlined in the pilot course is appropriate, comprehensible, and clearly presented.

Thus, we are interested in having your opinion upon the pilot course as a whole, and by answering the questionnaire we hope to have your overview on the pilot course.

► The questionnaire is ***structured and centred*** on objectives, activities and contents of the pilot course.
The questionnaire contains ***open and multiple-choice items***.
For the open items, you are required to elaborate your answer and to provide it in the afferent space.

Open items do not restrict the interviewee in their answer on preset alternatives. Open questions are especially suitable for the survey of experiences, opinions, attitudes, persuasions and values, if it is not likely that one can presume to know the answer. The interviewee gets the possibility to make free associations and to clarify their personal perspective.

For the multiple-choice items you have to select an answer from the list of provided answers.
Multiple-choice items (also called closed items) set the possible alternatives of response in advance. These kinds of questions are especially suitable, if it is very likely that one alternative is the adequate answer. In addition, this type of questions is very supportive in making sure that one has understood the interviewee correctly or to focus on a distinct aspect.

► When selecting the student-teachers at least minimal selection criteria have to be observed, meaning the student-teachers:
- to belong to Electronics/Robotics specialization or to the related / connected specializations;
- to be in 2nd, 3rd (or last) year of study (it is not recommended to involved beginner students, but those students who have undertaken already at least part of their pedagogical training afferent for the future profession of teacher in the pre-university education);
- to be able to prove their wish of being involved in such pilot training (well motivated);
- to show/manifest team spirit and to manage working in a team;
- to hold proper skills and knowledge for using/handling Robots;
- to be proficient in English;
- to have good school results (scores) for the previous academic years.

Number of student teachers per testing partner: 15

►Related to the ***application procedure***, we recommend the questionnaire to be applied immediately after the pilot course has finished, simultaneously to all participants.
The questionnaire will be provided in printed version and the interviewees will be allowed to take all the time they need to fill in the questionnaire, as it does not have the purpose of a didactic evaluation.
Participants will be asked to work individually, thus the provided answers to express their personal opinions and views.
They will be encouraged to be direct and sincere in giving their answers, in the view of offering an accurate feed-back to the course developers and implicitly proper recommendations for the course refining and adjustment.

B. STRUCTURED QUESTIONNAIRE

Part 1. – Course design, content and pedagogical approaches

Please answer briefly the following questions in the space provided:

1. Are the learning objectives of the proposed activities clear?
    a. Yes
    b. No

2. Is the argumentation clearly laid out?
    a. Yes
    b. No

3. Are the teaching and learning activities well structured?
    a. Yes
    b. No

4. Is the description of the activities clear and comprehensible?
    a. Yes
    b. No

5. Please indicate the pedagogical strategies that are supported by the use of this module.
    a. Creation of problem situations
    b. Development of skills concerning problem analysis
    c. Development of skills concerning hypotheses formulation
    d. Broadening of students' knowledge within the scope of a given topic
    e. Development of skills concerning verification of the assumed hypotheses
    f. Others (state which) ……

6. We assume that the use of educational module enhances the possibility of acquiring new skills. Choose skills from the list below, that according to you, meet this condition (ie acquiring these skills is made possible or supported by the module)
    a. Application of ICT tools in solving a scientific problem
    b. Developing and interpreting graphical representations of scientific evidence
    c. Estimation of data uncertainties
    d. Proper use of sensors and interfaces
    e. Acquisition and storage of experimental data
    f. Creating models or using simulations of science processes
    g. Others (state which) ……..

7. Name the topics of science (physics, chemistry, biology, geography) curriculum in which, in your opinion, the module caused a broadening of students' knowledge

……
……
……
……

8. Name the section(s) of science curriculum in which, in your opinion, the module would be most useful

……
……
……
……

9. The general teaching objectives of the activities in this module were:
    a. To introduce a new concept, law, topic, problem etc.
    b. To introduce a new approach to teaching and learning
    c. To promote a new view of the nature of science
    d. To verify a technological application of a scientific principle
    e. To illustrate known scientific ideas (laws, effects etc.)
    f. Others (state which) …….

10. How do you appreciate the applicability of the module in current science teaching? Please choose one of the options below:
    a. As "Very useful"
    b. As "Useful"
    c. As "Indifferent"
    d. As "Unnecessary"
    e. As "Useless"
    f. I have no opinion

11. To what extent does the use of the module and associate tools *add value* to the teaching process?
    a. Positively
    b. Partially
    c. Minimally
    d. None

12. Identify what types of learning objectives are supported through the module (please provide examples in each category that you will identify):
    a. Transmission of conceptual understanding ……
    b. Acquire of methodological skills ……
    c. Creation of attitudes ……
    d. Creation of epistemological awareness …….
    e. Performing and accumulation of experiences ……
    f. Realizing rreasoning strategies ……

13. Please outline any difficulties you may have met while the module was taught to you.

……
……
……
……

14. Please add any other comments that would be useful to the module developers or other teachers interested in implementing the module:

……
……
……
……

Part 2. – Course delivery

Please mark your evaluation of each issue bellow with an **X**.
The scale is:
6 = Excellent, 5 = Good, 4 = Satisfactory; 3 = Mediocre; 2 = Bad; 1 = Very bad.
Fill your comments if applicable.
At the end identify yourself or leave this document anonymous.

Trainer

	6	**5**	**4**	**3**	**2**	**1**
Experience	☐	☐	☐	☐	☐	☐
Flexibility	☐	☐	☐	☐	☐	☐
Clarity	☐	☐	☐	☐	☐	☐
Enthusiasm	☐	☐	☐	☐	☐	☐
Pedagogic competence	☐	☐	☐	☐	☐	☐
Subject knowledge	☐	☐	☐	☐	☐	☐
Resource handling	☐	☐	☐	☐	☐	☐
Participation incentive	☐	☐	☐	☐	☐	☐
Relationship with the group	☐	☐	☐	☐	☐	☐
Rhythm	☐	☐	☐	☐	☐	☐

Comments:

_____

_____

Program

	6	**5**	**4**	**3**	**2**	**1**
Group length	☐	☐	☐	☐	☐	☐
Group homogeneity	☐	☐	☐	☐	☐	☐
Adequacy	☐	☐	☐	☐	☐	☐
Topics	☐	☐	☐	☐	☐	☐

Contents accomplishment	☐	☐	☐	☐	☐	☐
Resources	☐	☐	☐	☐	☐	☐
Documentation	☐	☐	☐	☐	☐	
Methodology	☐	☐	☐	☐	☐	☐
Evaluation	☐	☐	☐	☐	☐	☐
Results	☐	☐	☐	☐	☐	☐

Comments:

_____

_____

Settings

	6	**5**	**4**	**3**	**2**	**1**
Room	☐	☐	☐	☐	☐	☐
Environment	☐	☐	☐	☐	☐	☐
Facilities	☐	☐	☐	☐	☐	☐
Support	☐	☐	☐	☐	☐	☐
Organization	☐	☐	☐	☐	☐	☐
Management	☐	☐	☐	☐	☐	☐
Resources	☐	☐	☐	☐	☐	

Comments:

_____

_____

Global evaluation

Please add any comments that could help us to develop future training courses:

_____

_____

_____

Name: _____

Organization: _____

Function: _____

C. Processing the results

The two parts of the questionnaire will be analyzed in different manner, depending on the character of the evaluation item itself.

Thus, if it is about an objective evaluation item, the data will be collected in a centralized table (see the model bellow). This way brief statistical analysis can be done on the acquired data.

The general teaching objectives of the activities in this module were:	Student No. 1	Student No. 2	Student No. 3	Student No. 4	…..	…..	…..	Student No. n
a. To introduce a new concept, law, topic, problem etc.	1	0					0	0
b. To introduce a new approach to teaching and learning	0	0					0	0
c. To promote a new view of the nature of science	0	0					0	0
d. To verify a technological application of a scientific principle	0	0					0	1
e. To illustrate known scientific ideas (laws, effects etc.)	0	1					0	0
f. Others (state which) …… .	0	0					To induce active learning	0

Example:

The evaluation items with an open-answer character will be collected separately and carefully analyzed by a panel of experts, members of the curriculum designers' team. Usually, this open items offer a great value in improving the curriculum.

After processing the data collected form the questionnaire, an evaluation report will be elaborated by each testing institution and then submitted to the coordinator.