

EUDOXOS PROJECT EVALUATION



Eudoxos Project Teaching Science with a Robotic Telescope (TSRT)



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APPENDIX. Teaching Unit "Astronomy in a Rural School". C.P. Campiña de Tarifa.



INTRODUCTION

This draft of the guide to the Evaluation of the Eudoxos Project has the following structure:

First of all, we present the idea of educational evaluation held by the L.A.C.E. Research Group of the University of Cadiz (UCA). We also show a possible focus for the Evaluation of the Project, moving from Testing to Qualitative Evaluation and Authentic Assessment. We also emphasise the close relationship that exists between evaluation and teaching and learning methods: we have outlined our position on both these areas.

Secondly, we set out its more practical aspects and elements: main objective, clarification of the specific procedural principles for teachers, students and external evaluators (UCA) and a brief introduction/explanation of the evaluation strategies and tools to be used.

Thirdly, the evaluation strategies and tools are detailed, offering practical material to help teachers and students in the collection and analysis of information. We include a practical guide to the Teacher's Diary, and another to the Student's Portfolio.

Fourthly, we set out the phases of the Evaluation so that all the participants and collaborators in the Project are as clear as possible about the steps we should be taking (without losing our overview of the process).

Before starting, it is important to point out that the following guide is only a *draft*, and it is therefore open to those amendments deemed necessary by all the partners in the project.

The appendix consists of a teaching unit designed by the teachers of "Campaña de Tarifa" school, which will serve as an introduction to the subjects which will be studied in more depth during the Eudoxos Project (Astronomy). This unit is an example of the everyday work in this centre which covers primary education (students of 6-11 years) and the first cycle or stage of secondary education (students of 12-13 years). The unit, therefore, follows and exemplifies the curriculum of the centre. It is important to point out their multidisciplinary approach to the content, ie, they undertake activities related to various areas of the curriculum, not only with reference to science, but also to writing, speaking, physical expression, and socio-affective factors, etc. "Campaña de Tarifa" school always works in a multidisciplinary way, so they have naturally applied this way of working to the Eudoxos Project.

Another thing that it is important to point out is that the age of the students (12 and 13 years) is somewhat lower than that of the students in the other educational centres participating in the project.



The reason for attaching this very concrete conceptualisation of the implementation of the project is to illustrate the possibility and necessity of being flexible and offering a framework that is completely adaptable to schools which are different, individual and idiosyncratic.

Lastly, we would like to point out that we cannot support the use of strategies based on testing. In addition to technical problems already highlighted in scientific literature, testing tries to make not only the results of the centres but also their teaching processes homogenous and uniform through the use of testing tools. The L.A.C.E. Group (UCA) wants the opposite: respect for different starting points, different paces of teaching and learning, different curricula and the idiosyncrasies of each school. As a result, our proposal leans towards an evaluation of the process with the involvement of those at the centre of the educative process (schools, teachers and students) and not focused exclusively on the results of student learning.

All these aspects will be discussed in more detail in this proposal for the evaluation of the project.



A. EVALUATION OF THE EUDOXOS PROJECT

Teaching for Understanding. What is really most important in education.

Educational research describes teaching as a complex activity which is characteristically simultaneous, multidimensional and unpredictable (Darling-Hammond, 2001). In the classroom contradictory objectives and multiple tasks are negotiated at a very fast rate; changes are continually made, and obstacles or unforeseen opportunities appear. Every hour and every day teachers have to reflect on and take decisions to create a safe environment and encourage learning, pressurised by the need for academic performance and the need to satisfy each individual student and the demands of the group. Realities such as these contradict the bureaucratic view of teaching as a task directed at a limited number of aims and simple, predetermined objectives; organised into a sequence of activities and uniform lessons for all the students in a particular class, or in different classes or countries.

Therefore, any teaching plan that does not take into account the complexity of these schools is not consistent with reality and does not respond to the necessities, interests and situations that arise in every educational situation:

“Probably, whenever we bring together 25 to 30 people of the same age, whatever age that might be, we find major differences in development, levels of knowledge, types of personality, expectations, interests, etc. and, precisely because of that, one of the most significant characteristics of teaching is that of having to create a “complex” and “diverse” environment; and therefore one of the conditions that any teaching strategy should meet, if it wants to be effective, is the ability to adapt itself to this complexity and diversity”. (Porlán, R., 1996: 31).

It is absolutely necessary to adapt every project, plan, activity, etc., to the real situation in each context. There are various pieces of research (Good and Brophy, 1997) highlighting that the best teaching is that which is adapted to each situation, to the educational aims and planned outcomes, to the students and the lessons.

There is no point in an educational approach based on the transmission of knowledge (teachers give academic lectures or use textbooks, students memorise content). On the contrary, the process of teaching and learning must go hand in hand with the social construction of knowledge on the part of the students. The following table lays out the main aspects that define the two major theoretical approaches to the process of teaching and learning: Transmission of Information versus Social Construction of Knowledge:



TEACHING AND LEARNING AS TRANSMISSION OF INFORMATION
VERSUS SOCIAL CONSTRUCTION OF KNOWLEDGE
(Good and Brophy, 1997: 403)

Transmission View	Social Construction View
Knowledge as fixed body of information transmitted from teacher or text to students. Texts or teacher as authoritative source of expert knowledge to which students defer.	Knowledge as developing interpretations co-constructed through discussion. Authority for constructed knowledge resides in the arguments and evidence cited in its support by students as well as by texts or teacher; everyone has expertise to contribute.
Teacher is responsible for managing students' learning by providing information and leading students through activities and assignments. Teacher explains, checks for understanding, and judges correctness of students' responses.	Teacher and students share responsibility for initiating and guiding learning efforts. Teacher acts as a discussion leader who poses questions, seeks clarifications, promotes dialogue, helps group recognize areas of consensus and of continuing disagreement.
Students memorize or replicate what has been explained or modelled.	Students strive to make sense of new input by relating it to their prior knowledge and by collaborating in dialogue with others to co-construct shared understandings.
Discourse emphasizes drill and recitation in response to convergent questions; focus is on eliciting correct answers.	Discourse emphasizes reflective discussion of networks of connected knowledge; questions are more divergent but designed to develop understanding of the powerful ideas that anchor these networks; focus is on eliciting students' thinking.
Activities emphasize replication of models or applications that require the following of step-by-step algorithms. Students work mostly alone, practising what has been transmitted to them in order to prepare themselves to compete for rewards by reproducing it on demand.	Activities emphasize application to authentic issues and problems that require higher-order thinking. Students collaborate by acting as a learning community that constructs shared understandings through sustained dialogue.

“As educators, we want students not just to retain information but to develop deep understandings and reflect thoughtfully about what they are learning. We want them to become scientific inquirers, critical thinkers, systematic problem-solvers, and value-based decision makers. If these lofty goals are to be accomplished, we need to teach with emphasis on higher-order thinking about the implications of what is learned.” (Good and Brophy, 1997: 399).



A curriculum that is consistent with the Social Construction of Knowledge approach has to be open and flexible to make it possible for all students to learn and has to respect different learning rates.

Taking into account that we have just outlined, we propose that Eudoxos Project is approached as a Telecollaborative Curriculum Project (TCP) (Angulo, F. 2003). A TCP is a project for students in which understanding, knowledge construction and collaborative learning are promoted.

Understanding is the ability to think and act flexibly with what one knows. Understanding can be appreciated (appraisal) and developed via the performance of understanding: activities and practice that give students the opportunity to understand and learn.

Knowledge construction means that the students have to use arguments and evidence, ask and answer questions, it promotes dialogue, emphasizes reflective discussion, etc.

Collaborative learning means tele-working with other groups of students or partners sharing experiences, ideas, results, doubts, etc.

The TCP must:

- Be flexible in terms of the structure to be adapted to countries and schools
- Be a learning tool that motivates and challenges the students
- Be a pedagogical tool for the teachers
- Focus on the students' work and collaboration
- Focus on the process much more than on the "results"
- Combine information from the Net, information from other sources and field research information
- Subordinate the technology to the pedagogical material

TCPs are not teaching plans with pre-specified learning objectives.

Evaluation and Assessment: Why is Testing not the best way to evaluate the Project?

Evaluation in education can be understood in two distinct ways: with a broad view of the concept or with a narrow view. In Anglo-Saxon countries a distinction is usually made between *evaluation* and *assessment*. These terms correspond to the two views of evaluation. (Angulo, 1995: 197).

Evaluation or broad view refers to the process through which we come to know and evaluate the quality of "the service" (or the project) and the role of the various components in delivering the service.



Assessment or narrow view refers to the process through which we establish “quality” only by means of the impact of “the service” on individuals or groups of individuals, restricting the understanding of quality of educational service to its effect on students. In addition, the narrow view of evaluation underlies some everyday words such as “exams” and “tests”, and other more technical ones such as public exams, educational quality indicators, performance measurement, testing systems, etc.

Within the *narrow view of evaluation (assessment)* there is a general and commonly-used concept: “tests”. Tests represent the essence of scientific measurement in psychology and education, the followers of this narrow view of evaluation wrongly believe and defend the fact that its use shows up students’ learning clearly and thoroughly, which allows discrimination between students on the basis of merit.

However, in all of this, various things are usually forgotten:

Firstly, it is forgotten that a test is a *measurement tool* that collects very specific information about an individual or group of individuals. But it is not the only tool that we have at our disposition. It could be that we limit ourselves to the *narrow view (assessment)* with tests being the fundamental tools, but not even in this case are they the only ones. If on the other hand we feel more inclined towards the *broad view*, tests are one of the many tools that we can use and are not even the most important.

Secondly, tests as *tools* are only a sample or selection of questions or situations (called items) taken from one area of content or interest” (Madaus, 1988: 30). The psychometrician has to make sure that it is representative of the field in general. In technical terms this is called the validity of the test.

However, tests can only tell us whether the student has answered correctly or incorrectly, without showing the underlying causes of these answers (correct and incorrect). That is to say, tests do not help us understand the educational reasons why the marks are high or low, nor how to solve or improve the problems or difficulties that may be detected. (Berlak 1992; Broadfoot 1983, 1984; Broadfoot, Murphy and Torrance 1990; Gipps 1994).

This tool is regarded as being certain, thorough and scientific, in the sense that it allows mental states, intelligence, learning or certain characteristics of social interaction. (See Berlak 1992 & Madaus 1988a).

However, this characterisation is questionable for various reasons:

- It is clear that tests measure those meanings, concepts, experiences that society believe to be valuable, standardized and homogenous without taking into account that learning, achievement, attainment, are concepts that take on different historical, social and political meanings; and therefore, are not universal, unchanging truths.



- The psychometric approach has held a fragmented view of learning and knowledge practically since the beginning, but it has been particularly influenced by the area of conductive psychology (since the 1950s). This fragmentation can be seen in the tests in the separation between the cognitive, affective and connective areas and in their decontextualisation. Decontextualised teaching lacks meaning for the students, distorting and obscuring the richness and complexity of the learning process.

“The importance of the content does not lie in facts and routine skills, but in the understanding of concepts and relationships, that is what gives meaning and usefulness to facts and skills” (Darling-Hammond, 2001: 105).

By putting evaluation and tests on the same level we limit the amount we can capitalise on the significance, richness and complexity of the former. Therefore, deciding about the future of an individual or group of individuals, about the performance or professionalism of a teacher, about the state or quality of a system, about teaching and learning experiences, or the future direction of education policy, basing ourselves on the marks obtained in certain tests, however numerous they may be, is a questionable and educationally-and politically-irresponsible exercise.

We can conclude that the adoption of the narrow view of evaluation or the technique of tests as the theoretical framework for the evaluation of a project (of some innovative teaching and learning experiments), seriously mars the knowledge about and perception of the quality of such a project, reducing the process to pure information collection using tools which are technically and educationally limited.

In this case, it seems to be assumed that quality depends purely on the “results” measured in student performance. This implies that the quality of teaching and the quality of the educational centres is determined by the success rates of the students.

Finally, it is important to add here that evaluation methods have a decisive influence on teaching. For example, the use of standardised tests, as often happens in the United States (Darling-Hammond, 2001), has a powerful influence when it comes to determining what to teach, how to teach, what the students study, how they study and also what they learn. The use of this method of evaluation results in a classroom emphasis on memorisation of isolated facts and vocabulary, to guarantee that the students pass their exams.

But, as a consequence, they never develop the ability to use the knowledge and skills in new situations, connect ideas from different subjects or fields, etc. That is to say, they have not arrived at the development of understanding: the knowledge they have acquired is inert, it cannot be remembered, transformed or applied in a significant way to new situations or problems.



On the other hand, when the evaluation methods take a global view of the whole process of teaching and learning and concentrate on understanding what goes on in the classroom, (and do not check what the students know about the content laid-out in the curriculum), more enriching and dynamic educational processes are allowed to develop. The aim of this form of evaluation is the analysis of educational practice, to later be able to take steps towards improvement. This approach encourages active learning (projects, discussions, research, etc.,) that allows students to develop complex thought processes. They will be capable of remembering and applying what they have learnt, and make connections between what they already know and new content by relating it to their experience.

Global, Qualitative Evaluation: What do we want to evaluate and how?

The evaluation that we suggest is concerned with analysing the influence of the various components of the teaching and learning process (curriculum, methodology, organisation of the centre or of the classroom, teachers and students) in educational quality.

Evaluation processes are converted into research processes in the classroom. This research should be based on the following principles (Porlán and Martín, 1996):

- a) Research done by students: as a way of creating rules, attitudes, skills and knowledge in the classroom.
- b) Research done by teachers: as a way of adopting reflective practices and continuing professional development.
- b) Curricula which are open and experimental as a way of establishing the correct balance between the planning and evaluation of teaching.

The Eudoxos Project (Learning Science with a Robotic Telescope, TSRT) is within the framework of the e-Learning Plan of the European Union, and is designed to be an **innovative** project. The innovation, in this case, is the achievement of learning about natural sciences through the use of a telescope via the Internet and the promotion of telecollaborative learning.

The value of a new innovation does not depend on the quantity that the students learn, but on more factors: the design of the innovation, its implementation, consideration of the contexts (schools) in which it will be applied, the understanding of the innovation by the agents, etc. An innovation therefore includes everything.



Authentic Assessment as the basis of Student Evaluation

The broad view of evaluation demands that the most important aspect of the evaluation is student learning. With this in mind, and as an alternative to Testing, some years ago the concept of Authentic Assessment (Torrance 1995) was added to the field of learning evaluation. Authentic Assessment means that students are exposed to tasks which are designed to confront them with situations which are more practical, realistic, and challenging than those offered by traditional tests. (Torrance, 1995).

There are two basic elements that define the kind of tasks which are included in the Authentic Assessment approach: the production of knowledge and disciplined investigation:

Production of knowledge means that students have to produce, more than reproduce, knowledge and express it in different forms: speeches, performances, compositions, problem-solving, etc.

Disciplined investigation assumes the use of previous knowledge (substantive or conceptual and procedural), deep understanding (of a problem or situation) and the integration of knowledge (interpretation of information, formulation of ideas and comments which require the re-organisation, synthesis and coherent re-structuring of knowledge in a different way).

With regard to the specific evaluation strategies and tools, Authentic assessment highlights the following:

- The strategies and tools used in global, qualitative evaluation should be sensitive to social and educational phenomena, the ethos of the school and the needs of those directly involved.
- Tools and strategies should not artificially separate the cognitive, affective, connective, interactive and situational aspects of learning.
- They should also allow the various social groups involved to freely express their opinions, criticisms, uncertainties and problems.
- Instead of forcing teaching to adapt itself to the structural and technical requirements of certain forms of evaluation, as happened with tests (to be precise, tests of criteria and minimum competence), evaluation must be subordinate to the natural complexity of learning, school-based knowledge, the process of teaching and the curriculum. (Angulo, 1995: 216).



RECOMMENDED READING ABOUT EVALUATION:

MacDonald, B. (1987) Evaluation and the control of education, in Murphy, R and Torrance, H (Eds) *Issues and Methods in Evaluation*, London: Paul Chapman

House, E.R. (1980) *Evaluating with Validity* London: Sage

Norris, N. (1990) *Understanding Educational Evaluation* London: Kogan Page

Kushner, S (2000) *Personalising Evaluation* London: Sage

B. THE MAIN AIM OF THE EVALUATION

The main aim of the evaluation of the project is to **understand the processes of change** that take place in the various participating schools, caused by the use of the Internet-run telescope and within the lesson plan framework.

C. PROCEDURAL PRINCIPLES

During the *Evaluation*, those that play an important role in the teaching and learning process in the classroom must actively participate, ie, the teachers and students must be involved. They are the most appropriate to provide information and evaluate the implementation of the project; given that they are directly involved. Their opinions, comments, recommendations, difficulties encountered, etc., with respect to the implementation of the lessons and the use of the telescope, can be a rich source of information in trying to understand the processes of change in each different context.

In order to provide a contrast with the information and evaluation given by students and teachers, the external evaluators will analyse *from outside* what is going on inside classrooms. This triangle of information from different sources gives internal validity and coherence to the evaluation process.

a. Role of teachers in the evaluation process

Teachers take on a fundamental role in the evaluation of the project, given that they constitute the link between two different levels in its realisation: the design and its application in the classroom (direct work with the students). Their privileged position in this respect is fundamental to inform, analyse and evaluate all the details of the implementation of the project. Their contributions must be the most honest, thorough and systematic possible. They are the real centre of the whole project, in its implementation, as well as its evaluation.



Their role in the evaluation process should be connected with the following tasks or responsibilities:

- Guarantee the appropriate use and application of the tools for the collection and analysis of information in their schools.
- Transmit the philosophy of the evaluation to the students: tell them about their role in the project and in the evaluation, make them participate in the whole process, explain to them how to input appropriate and useful information for the evaluation of the project.
- Coordinate of the use of evaluation tools in the classroom to allow the expression of shared opinions and comments in order to produce conclusions and summaries.
- Keep in contact with the coordinators of the project, and inform them about problematic, relevant, curious and interesting aspects, so that they can consider them throughout the process.
- Keep in contact with the external evaluators: inform them about doubts that arise about the evaluation process, share with them the process of using the practical guides to the evaluation tools, give opinions and comment on significant situations with respect to the various aspects of the project (application of the lesson plans in the classroom, contextualised difficulties, use of the program to use the telescope, etc.)

b. Role of students in the evaluation process

It is of primary importance that students make the contents of the project and the use of the program to use the telescope their own, and because of that they are the most appropriate to comment about the extent to which this happens, what steps they take and what difficulties they encounter. It is important that they maintain an open relationship with the teacher, and they comment freely about the most representative and difficult incidents. More precisely, students should actively participate in the collection of information; using the strategies that we propose (Teachers' Diaries and Students' Portfolios). The collection of information will have to be the result of systematic, thorough work. Similarly, the comments made must be very honest.

c. Role of the physics experts

For the consortium, it is important to know the results of the use of the framework and the e-tool designed for the project. One of the areas in which some members are really interested is ascertaining the influence that the specially-designed educational programme and the programme that allows images collected by the telescope to be viewed via the Internet have on student



knowledge. They want to know the way in which the project affects the knowledge the students acquire about astronomy, physics etc. To investigate this, it would be necessary to create evaluation instruments directly related to the subject matter that would allow the amount of learning achieved by students to be gauged. We must therefore count on the active collaboration of the physics experts that form part of our project.

This evaluation will be sent to UCA in the form of a report written by the experts. This quantitative data will be used by the L.A.C.E. research group as data which is complementary to the qualitative documentation, thereby enriching the evaluation process. “

d. Role of the external evaluators

The team from the University of Cadiz have taken on this role of external evaluators. Their responsibilities during the implementation of the project should be the following:

- Monitor the process, maintaining contact with the various parties (teachers, students, coordinators).
- Advise the teachers of the four schools in the development and use of the tools designed to carry out the evaluation with the intention of making the greatest possible use of the information registered.
- Carry out on-line interviews with teachers to get further information, if necessary.
- Produce a Final Report on the Evaluation of the Project, using the information submitted by each school and that registered personally during the process.

D. EVALUATION STRATEGIES AND TOOLS

The evaluation strategies and tools that we propose match the characteristics required by global, qualitative evaluation. Fundamentally, the teachers and students will be responsible for registering and analysing the information for the evaluation. The tools we propose for them are the following:

- a. Teachers' Diaries
- b. Students' Portfolios



E. TEACHERS' DIARIES

Introduction

The model of education which is in harmony with the concept of evaluation, as previously defined, demands a central role for those who are at the centre of the teaching and learning process: teachers and students.

- We consider that social reality is extraordinarily complex and rich.
- This complexity is reflected in the teaching and learning processes started in the classroom. We understand that these processes, because of their complexity, have to be tackled with a critical and social eye that allows them to be understood and improved.
- We believe in human development and learning, brought about via a continuous process of construction and investigation.

Teaching goes further than more formal, academic explanation of the content by the teacher. And students, from our point of view, are not obliged to memorise and reproduce such content. The model of education that we believe to be relevant and significant is that in which students and teachers reflect on their daily work in order to improve it.

The teacher becomes a fundamental *mediator* between educational theory and practice. The teacher analyses, interprets and takes decisions about the teaching and learning process. The teacher is an active agent of everything that happens in the classroom taking on a role as regulator and controller of educational events.

The teacher diagnoses problems, formulates hypotheses, experiments and evaluates these hypotheses, chooses and selects materials, designs the activities, etc. He or she is, definitely, a *researcher* in the classroom.

The teacher has to develop a strategy that allows him or her to carry out a systematic, critical and significant analysis of the events that take place in the classroom. The *Teacher's Diary* will be, without a doubt, one of the most relevant and useful tools that the teacher will have to achieve this objective.

The Teacher's Diary

The *Teacher's Diary* is a tool for the collection and analysis of information that allows the teacher to analyse thoroughly and systematically what happens in his or her classroom. It allows also to reflect on the teaching and learning processes put into action in class and carry out a critical analysis of his or her daily work. The ideas, contributions and views that a teacher could collect with a



tool like this *Teacher's Diary* seem to us to be extremely valuable. The evaluation that the teachers can make of the day to day implementation of the project will be of great use in judging the impact of the Eudoxos Project

How to produce the Teacher's Diary

The purpose of the *Teacher's Diary* from L.A.C.E.-UCA's point of the view is that of an evaluation tool with which teachers will become aware of the things that happen in the classroom when integrating the teaching and learning process with the lessons and the telescope that the Eudoxos Project proposes. Teachers will develop this tool, in three main phases, related to each of the phases of the implementation of the Framework and of the Telescope.

- 1st Part: Before the implementation of the Project.
- 2nd Part: During the implementation of the Project.
- 3rd Part: After the implementation of the Project

1st Part: Before the implementation of the Project

It is important that teachers give their initial points of view about the Project before putting the lessons and *on line* work into practice. This initial evaluation will allow us to discover how the process of implementation of the project changes preconceptions, previously-held ideas about learning possibilities etc. All of these ideas will help us to better understand the influence of the project in each school.

2nd Part: During the implementation of the Project.

This phase of evaluation by the teachers will be of vital importance. When the lessons start to be used in class, it will be fundamental to try to collect information about the teaching and learning process that is being undertaken, the reactions of the students to the content, etc.

3rd Part: After the implementation of the Project

When the work has finished, it will be necessary for teachers to analyse in a general way all the work done. It will be important to have an evaluation of all that has gone on to gauge the influence of the project, taking into account how far that project has met original expectations, the most important aspects during its implementation, etc.



TEACHERS' DIARIES

1ST PART. BEFORE THE IMPLEMENTATION OF THE PROJECT

We propose that you undertake an initial evaluation of the project. You can do it via the following questions which will point you in the right direction:

- What do you think of the project in general? What educational possibilities do you think this e-learning can offer your school?
- Offer your opinion of the educational planning of the project: What do you think of it? What do you expect from it?
- Give an opinion about the aspects of educational innovation that this project can contribute to your daily work in particular and your school in general.
- What educational expectations do you have with regard to the framework and the use of the telescope? How do you think that this project can encourage the learning of science by your students?, And your professional development?
- What would you add to the project bearing in mind your teaching needs and in those of your school? What would you take out or change?
- Others...

TEACHERS' DIARIES

2ND PART. DURING THE IMPLEMENTATION OF THE PROJECT

Below we propose some categories that will help you collect all the information possible about the things that happen in the classroom during the implementation of the project. We suggest, facilitating the process of evaluation, that you are going to undertake, that you do this work every time that you going to do activities related to the project. That way you can evaluate your work and the teaching and learning process in a practical and systematic way.

Lesson Planning

This first category of analysis will help you analyse your intentions and create a design in accordance with the objectives that you plan to develop during each class. You can respond to these questions, making a note of your comments.

- What do you intend to achieve in this lesson, taking into account students' previous knowledge?
- How will you adapt the lesson to the particular characteristics of your students?
- How will you select and organise the content to be worked on? Give your point of view about how adaptable the lesson plan is to the particular characteristics of your school.



- What activities will you undertake to achieve the objectives you have set for this lesson? Describe them briefly and say what resources are necessary to carry them out.
- What teaching methodology will you use to work on the content with your students?
- How will you organise your classroom to carry out these activities?, How will you organise the time?

Access to and Use of the Online Tool

When you have to put certain lessons into practice, you will have to prepare technical resources and materials like images from the telescope with specific coordinates, specific information from the project web page, etc. We propose:

- Fluidity of information on the web page
- General functioning of the program
- Quality and effectiveness of the documents and images from the telescope
- Possible communication difficulties
- Quality of the assessment of the professionals
- Others...

The Lesson Plan in Practice

In this section you should make a note of all the relevant events that happen in class once you put the lesson plan into practice. This is about describing the classroom dynamics via systematic and detailed accounts of what happens in the classroom. This exercise might appear very complicated at first, especially in relation to the separation between description, interpretation and the spontaneous evaluation of processes but this difficulty will be overcome once you acquire the critical ability to be able to differentiate between spontaneous description and calm, systematic, rational analysis.

The situations collected in your description will allow you to discover problematic aspects that you will be able to resolve on a daily basis when analysing what you have written, accepting the complexity of the teaching and learning process, encouraging improvement via reflection on your daily work. We propose some areas for consideration that will help you produce this description.

- How did the lesson develop? Do you think your methodology was appropriate? Briefly describe how the class was, what was the general dynamic? etc.
- Describe how you undertook the activities in class: how did you present them, how did the students react, what results were you able to see, have the students learnt anything from them? Highlight possible difficulties, curious aspects, incidents etc.



- Do you think the students understood the content?, How did they feel?
- Was your space and time management appropriate?, Describe those aspects related to the management of time and space (the allocation of students to computers, the time dedicated to each activity, etc)
- Describe the reaction of your students to the e-tools. Recount how the work on the computer went, how the Internet worked, what implications working with this “virtual” telescope has had for you and your students?
- Think about how far you have achieved the objectives you set for this lesson: In practice did the e-tools give the results you expected?
- Describe the most significant psycho-social processes: your relationships with your students, relationships between them, negotiation processes, reactions, level of participation and implication, etc.
- Lastly, it would be very interesting for you to reflect on your feelings, needs, impressions, beliefs... in terms of the implementation of the lessons and the use of the e-tools in your classes.

You can accompany your description with photos of the class, your students working, of the organisation of the classroom and the computers, etc. Photos can sometimes offer direct, clear, rich information about the processes that take place in the classroom, and allow the reader to understand what went on there.

This kind of information will be very interesting for our research group. The pictures will allow coming closer with the reality of each class. It would be interesting that the main figure of the photos could voice comments about the situations that the pictures showed”.

[Analysis of the information collected](#)

In the previous section we proposed a description of the most relevant classroom events. This description, although thorough and true to reality, needs close examination which will allow an understanding of what really went on in the classroom. Critical reflection on those things entered in your diary will be required in order to analyse those things that took place when working with a telescope via the Internet.

You can organise the information however you want to. We will show you a way of structuring your analysis that could be useful, but it will be you that decides how to organise your ideas in order to get the most out of them: it will be this reflection that allows you to take reasoned and coherent decisions that will improve the teaching and learning process.



- (a) Conceptions of your teaching work: Evaluate your work as a teacher in this class: your teaching methodology, your relationship with the students, your way of approaching work with the computers and e-tool, the quality of the activities, etc. Suggest what you would change to improve your teaching.
- (b) Aspects with regard to students: Reflect on the learning process that your students have been through in the class. Analyse what aspects might require changes in order to improve their learning. Reflect on how they felt working with the telescope and the advantages and disadvantages of this way of learning physics on-line.
- (c) Analysis of the content and the e-tool: Evaluate how the content arrived at the students, think about to what extent their previous ideas about the material have been changed and enriched. Reflect on the organisation and sequencing of the content that they worked on. Make a note of contributions. Highlight how the telescope and web page were used, analysing the positive and negative influences on learning. Evaluate the reaction of students to this new way of learning physics. Note what you would change to improve the following classes.
- (d) Reflection on the classroom climate: It is important that you analyse the psycho-social dynamic of the classroom. Evaluate the relationships that you have established with your students, the way they have worked together, the possible conflicts and the solutions we can plan to resolve them, etc.

TEACHERS' DIARIES

3RD PART. AFTER THE IMPLEMENTATION OF THE PROJECT

Lastly, to cover everything that goes on in the classroom throughout the project, it will be fundamental that the teacher goes back to their initial ideas, thoughts, and expectations (collected in the first part of the *Teacher's Diary*). This review will allow them to see if their expectations have been met and therefore it will help us to understand the influence of the project in each school. We will be able to discover the ability of the e-tool to improve the learning of astronomy in particular and of sciences in general, evaluate the contribution of this project to innovation in education, etc.

We propose the following questions to help you carry out this evaluation exercise.

- Offer your general opinion about the implementation of the project in your school.



- Has this e-learning lived up to the educational expectations that you had of it? Evaluate the educational value of the e-tool and Lesson Plans.
- What do you think about the implementation of the Lesson Plan in your classroom? What did it bring you as a teacher?
- Explain the positive aspects for student learning that participation in this project has brought. Analyse how they have worked with the content, what abilities they have developed through working with the Internet, their motivation level when using the telescope, etc.
- Highlight the advantages and disadvantages that the Eudoxos Project has for the teaching of science.
- Note the educational and technical difficulties that you experienced. You can make recommendations, aspects that you would improve, etc.

F. STUDENTS' PORTFOLIOS

Reason for and usefulness of the Portfolios: Evaluation through files of work.

Students that learn content by understanding it, do not only learn the content itself, but also appreciate the reason for learning it and retain it so that they can use it again when necessary. The *Student's Portfolio* constitutes a fundamental tool with which each student monitors their learning process systematically and thoroughly and becomes aware of the usefulness of the content they are working on. It will help (or try to help) students to develop the ability to evaluate their own learning process and work. Similarly, their opinions with respect to the multiple elements that form part of the whole (content, activities, methodology, way of working, space and time management) will take on a considerable importance in the global evaluation of the teaching and learning process of the group. In addition, teachers will have a rich source of information about where the student was at the beginning, what steps they have taken, what processes they have followed, where they have arrived, what aspects have interested them most, what difficulties they have found, etc.

Physical Characteristics of the Portfolios: How they should be created and used.

A *Portfolio* is a file in which each student keeps a record of the activities undertaken within the framework of the project. The portfolios for the Eudoxos Project are divided into three main parts, which correspond to the three main phases of implementing the project in the classroom:



- 1st Part: Before the Implementation of the Project
- 2nd Part: During the Implementation of the Project
- 3rd Part: After the Implementation of the Project

Students should respond to the questions posed (in the first and third parts) and collect, during the implementation phase, materials used in class activities (texts, images, notes, etc.), activities done and reflections on the knowledge acquired, strategies, ways of working (with the Internet, in groups, individually, etc.), interests, feelings that the activity provoked, difficulties experienced, solutions for the difficulties, etc.

As we indicated before, for the UCA research, pictures would be very interesting and additional information. The students could make photos about their different daily schools life: working with the e-tool in the computer, the teachers' explanations of any activities, etc. Each student could express their ideas in relation to the situations represented in their photos.

Practical Guide for Students: steps to follow.

STUDENTS' PORTFOLIOS

1ST PART. BEFORE THE IMPLEMENTATION OF THE PROJECT.

Answer the following questions, either one by one or by writing a general summary of your answers to all of them. You can use pictures, drawings, texts, personal comments, etc.

- What do you think of the project?
- What do you think about its presentation?
- What information do you have about the Eudoxos Project?
 - What possibilities do you think the project offers you?
 - At the moment, what do you know about the activities you are going to do?
- How would you like the activities to be?
- What would you like to learn with the framework of this project?
- What attracts you most about the project?
- What do you expect of the project?
- What would you add to the project bearing in mind your needs as a student?



STUDENTS' PORTFOLIOS

2ND PART. DURING THE IMPLEMENTATION OF THE PROJECT

For each of the sessions or teaching units (each one of the lesson plans) that you work on in class, you will have to collect the following information:

- Put together the materials (texts, pictures, personal notes taken, etc.) that you use in each session.
- Collect together the activities that you do (things you produce: drawings, sketches, essays, Internet searches; problems set in class and solved; group activities, etc). It is important to indicate how you have done them, eg individually, in a group, exchanging opinions with students in other European schools via the Internet.
- At the end of each session or each lesson it is important that you make a retrospective schedule of the timing of the activities in class, ie, that you write in your own words the process that you have followed during the session. For example: teacher's explanation, undertake the activities proposed by the teacher, use of the Internet to view the selected planet, etc.

It is also important that you collect information about the step by step development of each session, those moments in which you get lost, you do not understand why you are doing that particular activity, you think it would be better to change the order of the activities, or also, if you would have removed one of them because it did not have any significance for you.

- Also when you finish each session or each lesson it is very important that you register your personal comments, your evaluation, the difficulties that you experienced, the aspects that you would change, those that you would remove and add. It is vital that you are completely honest in these comments, and even better that you are explain and back up your opinions.

To give you an idea of where to start, you could answer the following questions: What did you think of the activity? Was it interesting? Where did you have difficulty? How did you work: individually or in a group? What would you change? How would you like to continue?



STUDENTS' PORTFOLIOS

3RD PART. AFTER THE IMPLEMENTATION OF THE PROJECT

General Evaluation of the Whole Process

Reread the expectations that you wrote down at the beginning of the project, and answer some of the following questions:

- Have your expectations been met?
- Why? Why not?
- What aspects would you change?
- What would you improve?
- What did you like most and least?
- What can you say you learnt?
- What do you think of the project in general?
- What material did you think was the most interesting?
- What material did you think was the most boring or complicated?
- Did you have difficulty using the telescope via the Internet?
- How did you feel when you were working with your classmates?
- How did you feel when you were working with young people from other countries?

G. PHASES OF THE EVALUATION AND TIMING

The following table shows a schedule for the phases of the evaluation of the project and their respective timings.

PHASES OF THE EVALUATION OF THE PROJECT		
1ST Phase: Exchange detailed information about the participants. March 2003.		
2nd Phase: Evaluation during the process of Implementation of the project.	Use of the Evaluation tools: Teachers' Diaries Students' Portfolios	Analysis of the process of preparation: Lessons Technical aspects (e-tool)



<p>April, May and June 2003</p> <p>October, November, December 2003 and January 2004.</p>		<p>Analysis of the implementation process.</p>
<p>3rd Phase: Production of Summary Documents</p> <p>January and February 2004.</p>	<p>Each school produces:</p> <p>Summary of Teachers' Diaries Summary of Students' Portfolios Conclusions/Recommendations.</p> <p>To be translated into English.</p>	
<p>4th Phase: Production of the Final Report</p> <p>February and March 2004.</p>	<p>UCA will take responsibility for the production of this report.</p>	

1st Phase. Exchange detailed information about the Participants.

When you try to integrate educational projects in particular schools, and evaluate the impact of these on each one, it is necessary to know something about these centres. Each school is unique: it is in its own particular context, with rich, diverse, complex socio-cultural realities and different people. It will be possible to discover the influence of the Eudoxos Project on each school, when the particular characteristics of each centre and the people that run it are known.

For this reason, we believe it is necessary that the participants in the project in each school write a *Report* that will allow us to understand the particular context in which the project will be undertaken: only then will be it possible to understand the influence of Eudoxos on the teaching and learning process in each classroom.

The report should include clear and direct information about those at the centre of the project (students and teachers); in a way that anyone unconnected with the centre could get an overall idea of the characteristics and peculiarities of



that centre. It would be fundamental for the report to include the answers to three main questions:

Who are we?
Where are we?
What do we do?

Below we offer you some categories of analysis which will point you in the right direction in the production of the report. However, you should feel completely free to highlight those aspects which you believe to be the most unique and idiosyncratic with regards to your school.

WHO ARE WE AND WHERE ARE WE?

GENERAL CHARACTERISTICS OF THE CENTRE

- Brief presentation
- Analysis of the immediate environment (characteristics of the population, where the centre is located, etc.)
- Socio-cultural and economic characteristics of the school
- Organisational structure of the centre
- Educational aims
- Pedagogical principles

WHAT DO WE DO?

TEACHING STYLE ETC OF THE STAFF INVOLVED IN THE PROJECT

- Methodology
- Most frequent activities
- Structure of lessons
- Space and time management of classes
- Resources used (laboratories, computers, access to the Internet, etc.)
- Evaluation

CHARACTERISTICS OF THE STUDENTS INVOLVED IN THE PROJECT

- Number of students
- Age
- Level of previous knowledge related to the content included in the project
- Learning styles that usually operate: rote-learning, collaborative learning, research projects, problem-solving, individual work vs team work, etc.
- Familiarity with the use of computers and the Internet in the school as a learning resource.



We propose that, to complement the report, you include photos of the centre , of the classrooms, of diverse everyday educational situations when students interact with teachers, students' ways of working, resources used in activities, spatial organisation of classrooms, work dynamics, etc. When producing the report it would be useful to describe and analyse the situations that have been photographed.

This report should be translated into English and will be fundamental in the overall evaluation process. It will constitute a basic reference document when producing the final report. If the external evaluators need any further information, this report will be complemented by on line interviews using open questions to focus on points that remain unclear or have not been answered.

2nd Phase. Evaluation during the process of Implementation of the project.

At the same time as the implementation of the project in the classroom, the collection and analysis of information for the evaluation will take place. To do this the proposed tools will be used: Teachers' Diaries and Students' Portfolios.

It is important that a good flow of communication is maintained between the coordinators, the external evaluators and the participants in the schools (teachers and students). The University of Cadiz will supervise this whole process, noting information which may be relevant to the final report.

3rd Phase. Production of Summary Documents.

In this phase, each school will analyse the information collected by each one of the evaluation tools (Diaries and Portfolios), and produce a summary of each one. Each school will produce the following documents:

- Summary of the Teachers' Diaries
- Summary of the Students' Portfolios

The *Summary of the Teachers' Diaries* should include those aspects which the teacher considers fundamental to the understanding of the process that has gone on in the classroom. Similarly, it is important that recommendations are made.

The *Summary of the Students' Portfolios* must be a document in which the teachers and students include the most significant materials, student work, general sequence of activities, opinions, suggestions, etc. The selection of this material must be carried out by both the teachers and students.



The summaries from each school (8 summaries in total) will be translated into English, and will constitute the basic source of documentary evidence for the production of the Final Report by UCA.

4th Phase. Final Report. UCA will produce a final report using the information obtained from the summaries and the notes made throughout the whole process (fora, meetings,) etc.

We propose that each participating school receives a copy of the Evaluation plan (once the draft has been agreed) in English and that the worksheets to carry out the contextualisation and the evaluation tools (Teachers' Diaries and Students' Portfolios) are translated into the languages of the four participating schools (Greek, German, Italian and Spanish).

COMMENTS WITH RESPECT TO THE WORK PLAN.

WP.5, covering Evaluation, has undergone significant changes in this Evaluation proposal. The Evaluation timetable would therefore be structured in the following manner:

WORK PLAN OF THE PROJECT																			
WP	ACTIVITY	2002			2003										2004				
WP5	Evaluation	O	N	D	J	F	Mr	Ap	My	Jn	Jl	Au	Sp	O	N	D	J	F	M
5.1	Development of the research plan	█	█	█															
5.2	Draft Evaluation proposal				█	█													
5.3	Exchange detailed information about the participants (1 st Phase)						█												
5.4	Evaluation during Implementation (2 nd Phase)							█	█	█				█	█	█			
5.5	Summaries (3 rd Phase)																█	█	
5.6	Final Report (4 th Phase)																	█	█



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