

## Learning dispositions and the epic methodology

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### Abstract

The paper presents the *EPIC* classification for the learning dispositions that are considered necessary for developing pupil autonomy. The methodology is offered to the teacher in order to design a curriculum that will stimulate and necessitate the use of learning dispositions, causing pupils to inquire, collaborate, share ideas, consider alternatives and reach conclusions when contemplating problematic situations.

### I. Introduction

The EPIC methodology was designed and utilized by the partnership of the SOCRATES/Comenius 2.1 pilot project titled “*Using Dialogue to Connect Learning [DIAL-CONNECT]*” coordinated by Stranmillis University College from Belfast, United Kingdom. The project partnership was composed by organizations from 9 countries:

1. Stranmillis University College, Belfast, UK (coordinating institution);
2. Universitatea din Pitești, RO;
3. Centro de Formação António Sergio, Lisbon, PT;
4. University of Cyprus, CY;
5. Umeå universitet, SE;
6. N. Zahle’s College of Education, Copenhagen, DK;
7. In-Service Centre for Teacher Education, Tralee, IE;
8. University College Worcester, UK;
9. IRRE Piemonte (the regional center), IT

The overall aim of the project was to encourage the use of dialogue as a tool for thinking and social interaction as a tool for learning.

The project had as specific objectives the following:

- f* To use stories as a stimulus for thinking and a context for learning empowerment;
- f* To build on the natural curiosity and creativity of the child through exploratory and reflective action;
- f* To adopt an interactive teaching style and learning ethos that will encourage pupils to take ownership and responsibility for their learning;
- f* To develop conceptual and procedural understanding through problem solving dialogue and social learning.

In this context, the EPIC methodology was designed to enable teachers to create the best environment for using the learning dispositions in classroom as efficient as possible. Also, EPIC represented a useful tool in assessing and comparing how pupils act in various learning contexts, how they respond to different stimulus and this way to formulate conclusions of the performed analysis for both improving the didactic demarches and for supporting pupils’ thinking.

### II. Details

#### II.1. Case study presentation

In the framework of the project, each partner had to use a story in teaching sciences. University of Pitești created an original story titled “The Journey” – the story of three water drops called Droppy, Drop and Boggy which went on a journey by performing the Water Circuit in nature – and used it in teaching Physics at the six grade (pupils of 13-14 years of age).

Time allocation for implementing the case study was 35 hours, distributed as follows:

- f* 6 hours of introductory session;
- f* 27 hours for implementing the story (12 hours of theory and 15 hours of experiments/practical works /projects);
- f* 2 hours for evaluation and assessment.

The innovative aspects consists in the fact that although the story framework is designed by the teacher, the story itself is developed by pupils and it is “built” by them under teacher’s guidance and monitoring...

The teacher worked supplementary with pupils, in addition to the compulsory weekly program. The acceptance of the school board & the parents was granted already.

The Romanian team of the project has designed and created the didactic materials and experiments for each stage of the case study implementation. Have been elaborated large posters on the walls, slides, dialogues “telling” the story to the pupils, drawings, graphics and animation as well...As a result of the contests organized among the pupils for selecting the names and faces of the characters lots of materials were gathered (printed, painted, written, etc).

A three hours movie was recorded by the help of a professional team working at the TV local station ANTENA 1 Pitești. The movie (containing the entire story but in a condensed form) represents “the pilot episode” of “The Journey” story. The movie was then used by the team of pedagogues and psychologists in analyzing the pupils’ behavior and reaction and in applying the EPIC methodology.

We have to mention that the enthusiasm of both pupils and teachers involved in the case study implementation was very high, the approach being proved to be a very attractive one.

The objectives we had for *the introductory sessions* were the following:

- To familiarize pupils with the concept of “international project” or “international collaboration”;

- To define the story as a working tool;
- To find proper and attractive ways for teaching physics based on stories and interactive dialogue;
- To explain the necessary skills to be acquired and developed in the view of team working & cooperation;
- To stimulate competition;
- To fructify competitive attitudes and behavior;
- To increase pupils' interest the in learning physics;
- To support the use of additional and complementary learning resources;
- To teach pupils how to investigate by themselves;

We established also a set of **General Objectives (GOs)**:

1. To know and understand the physics phenomena, terminology, concepts and methods specific to the field.
2. To develop the capacities of exploring/investigating the reality and also the abilities of experimenting, by using instruments and procedures specific to Physics;
3. To develop the analysis and problem solving skills;
4. To develop the communication abilities by using a language characteristic of Physics.
5. To create a critical attitude concerning the science effects upon the social and technological development, and also to develop the interest towards o the environment protection.

and of **Specific Objectives (SOs)** afferent to each GO:

***Specific Objectives afferent to General Objective no. 1:***

To introduce a new approach in learning Physics through understanding the Physics theories and their applications;

- To distinguish between different Physics phenomena, instruments and Physics quantities of the studied domain;
- To recognize within the practical activity the studied phenomena of the following fields: mechanics, heat, electricity, optics.
- To define and explain the Physics phenomena by using specific terms;
- To render graphics of the given Physics quantities variations.

***Specific objectives afferent to General Objective no. 2:***

To develop an autonomous and creative personality of the pupils;

- To notice phenomena, to collect and record observations referring to these;
- To follow the achievement of some experimental applications and the stages of realizing these;
- To assimilate working skills and abilities with different measurement instruments in the view of performing quantitative determinations/measurements;
- To organize, utilize, and interpret the collected experimental data.

***Specific objectives afferent to General Objective no. 3:***

*f* To compare and to classify the Physics phenomena of the fields: mechanics, heat, electricity, optics.

*f* To solve theoretical and applicative problems and situations;

*f* To realize inter-disciplinary transfers and to apply them for studying phenomena of: mechanics, heat, electricity, optics.

*f* To establish links between the domains of Physics and the other subjects.

***Specific objectives afferent to General Objective no. 4:***

*f* To acquire adequate methods of recording the experimental data;

*f* To formulate own observations upon the investigates Physics phenomena;

***Specific Objectives afferent to General Objective no. 5:***

To argue the role of certain technologies in different fields of activity. For **Evaluation and Assessment** our objectives were: To verify the:

- Acquirement of fundamental knowledge of Physics;
- Acquirement of specific knowledge of Physics;
- Development of intellectual abilities and capacities in solving specific problems;
- Development of practical skills;

In implementing the case study, distinct phases were marked:

• ***Deciding the story;***

• ***Enabling the teachers*** (sharing aims, objectives and purpose of project, sharing EPIC framework, looking for evidence of frequency of use in whole class, individual and group learning situations – for example, pupils cooperating to draft a document or letter; cooperating to solve a practical problem; willingness to persist with problems individually and interdependently... how well groups or particular individuals operate within the 5 levels of interaction);

• ***Applying the story;***

• ***Collecting the data:***

1. Video and audio recording.
2. Teacher questionnaire at outset.
3. Teacher and pupil evaluative questionnaire on conclusion.
4. Field notes from observations during case study.

5. Informal interviews.

Transcripts were made of the audio and video recordings. Appropriate selection (whole class, group and individual) has been done. The transcripts have been then analyzed (away from the classroom) in terms of the EPIC classification to give information on:

1. details of the activity, who and what was involved;
2. the nature of the interaction (transmission Vs transaction);
3. the type of interaction – inquiring, sharing, collaborating, exploring, agreeing.....
4. the level of interaction on a scale of 1-5;
5. other: other contributing factors – classroom organization and climate for learning; teaching and learning styles used; pupil motivation; resources used....

• **Analyzing the data** by focusing on several main research questions:

1. comment on pupil motivation (high or low) from using the story approach;
2. use of learning dispositions e.g. being curious, exploratory, open minded, resilient, interdependent... Frequency of use and factors contributing to this...;
3. comment on level of interaction observed (levels 1-5) and observed factors that contributed to different levels;
4. comment on the differences in the methods pupils used to solve problems or resolve problematic situations... in what ways did different groups or different individuals go about the task;
5. pupil perceptions;
6. teacher evaluation and reflection;

• **Drawing conclusions:**

1. pupil motivation;
2. use of learning dispositions – EPIC classification... observations and tentative conclusions;
3. levels of interaction of identified groups and/or individuals.... observations and contributing factors;
4. qualitative differences in solution methods... observations and reflection;
5. pupil perceptions – was the activity challenging? level of achievement reached? collaboration and interdependence.. how well did they work together;
6. teacher observations and reflections... Changes envisaged ... approaches and organization.

• **Reporting conclusions;**

• **Case study evaluation.**

**Educational Plan for Implementing the Case Study:**

<i>Week 1</i>	<b>Contents</b>	<i>No. of hours:</i>
	• Presentation of the project and of the idea that together, teacher and 1 pupils, will work on a story...in order to learn Physics!	1
	• Discussing about stories and the way the story could be used n physics 1 classrooms. • Introducing the idea/framework of the story.	1
	• Teacher presenting the story but very briefly: title is “The Journey” and the main characters are 3 drops of water... • Launching a contest among the pupils through which to find names and faces for the characters (pupils using comics books, the Internet, libraries, own drawings, etc.)	2
<i>Week 2</i>	•Developing the story: collecting from pupils arguments/motivations for realizing the journey; •Teacher using the arguments/motivations to “create” the story and to “stuff” it with experiments, practical work and projects.	1
	• Building the story on episodes: teacher and pupils design the story segment by segment...	1
	• <b>Episode 1: “The Journey”</b>	1
	• Experiment/practical works/projects	1
<i>Week 3</i>	• <b>Episode 2: “The Spring”</b>	1
	• Experiment/practical works/projects	1
	• <b>Episode 3: “The First Day”</b>	1
	• Experiment/practical works/projects	1
<i>Week 4</i>	• <b>Episode 4: “The Waterfall”</b>	1
	• Experiment/practical works/projects	1
	• <b>Episode 5: “The Encounter of Two Characters”</b>	1
	• Experiment/practical works/projects	1
<i>Week 5</i>	• <b>Episode 6: “The Quarrel”</b>	1
	• Experiment/practical works/projects	1
	• <b>Episode 7: “The Dam”</b>	2
<i>Week 6</i>	• Experiment/practical works/projects	4
<i>Week 7</i>	• <b>Episode 8: “The Delta”</b>	1

	• Experiment/practical works/projects	1
	• <b>Episode 9: “The Sea”</b>	1
	• Experiment/practical works/projects	1
<b>Week 8</b>	• Experiment/practical works/projects	1
	• <b>Episode 10: “The Flight”</b>	1
	• Experiment/practical works/projects	1
	• <b>Episode 11: “The Coming Back (The Return)”</b>	1
<b>Week 9</b>	• Experiment/practical works/projects	1
	• Evaluation and assessment	2
<b>TOTAL</b>		<b>35 hours</b>

## II.2. The EPIC Methodology

### II.2.1. EPIC: Domains of Learning Dispositions

The *EPIC* classification shows the kind of dispositions that are considered necessary for developing pupil autonomy. The challenge for the teacher is to design a curriculum that will stimulate and necessitate their use, causing pupils to inquire, collaborate, share ideas, consider alternatives and reach conclusions when contemplating problematic situations.

*f* Confidence: expressing an idea, thinking and communicating with clarity and precision

*f* Being curious: expressing curiosity or the desire to know more: questioning and problem posing,

*f* Open-mindedness: speculating, predicting, thinking aloud, remaining alert to situations...

*f* Responsiveness: responding with wonderment and awe, fun and enjoyment

#### **Productive**

*f* Exploratory: investigating, experimenting, and gathering data using all the senses

*f* Strategic: planning, setting goals, planning procedures, prioritizing, organising and ordering events during problem solving

*f* Applying: using what is known: applying previous knowledge and understanding to unfamiliar and unknown situations

*f* Monitoring: checking progress and thinking about thinking, reflective

#### **Innovative**

*f* Adventurous: handling uncertainty, taking responsible risks, sense of Adventure, trying out new ways of doing things

*f* Flexibility: thinking flexibly, suggesting alternatives, considering options, seeing things in different ways

*f* Being creative: creating, generating, imagining and innovating

*f* Evaluating: evaluating a method or outcome, suggesting modifications, or improvements

#### **Collaborative**

*f* Interdependence: interacting and thinking interdependently, working together, managing impulsivity, accepting responsibility

*f* Resilience: persistence in negotiating ideas and reaching conclusions

*f* Sensitivity: listening with understanding and empathy, suspending judgment

*f* Coaching: scaffolding, supporting and encouraging, assisting and guiding

### II.2.2. EPIC: Levels of interaction, exploration, and engagement

#### **Level 1**

Will not want to volunteer or get involved. Practices avoidance tactics and is reluctant to engage naturally. No signs of any explorative activity and any apparent activity has an absence of cognitive demand. Passive involvement with a low-level energy input.

#### **Level 2**

Engagement is conditional. Concentration is weak and is easily distracted. Lots of non-activity and not focused enough for explorative activity. Will attempt to engage only if asked directly by the teacher and normally in response to a fairly low-level question nor demand.

#### **Level 3**

Engagement is hesitant and explorations are routine and unimaginative. Real signs of engagement are missing. Some progress but lacking in energy and concentration. Easily distracted. Requires careful scaffolding of questions and probing to elicit an appropriate response

#### **Level 4**

Activity with intense moments: not continuous. Engagement and exploration is characterized by concentration, persistence and energy. Can manage distractions. Volunteers an answer but one that is incomplete: requires further probing to reveal a complete understanding.

#### **Level 5**

Continuous intense activity characterized by concentration, creative exploration, initiative, energy and persistence.

Volunteers answers and questions naturally. Engages in problem solving and problem posing. Coherent, well reasoned, holistic responses that demonstrate understanding and completeness.

### III. Conclusions

The analysis of the achieved case study aimed at identifying the pupil's behavior modifications, as a result of using a new Physics teaching method. The premise one started from, was the necessity of developing the children's autonomy, the teachers' task being to generate a context of learning, a problematic situation, which to stimulate the children, to make them ask themselves questions, collaborate, share their ideas, accept the other ones' ideas, formulate conclusions.

There were involved two working groups: one in which one uses the classical teaching /learning approach (witness group), and the other one in which one uses a creative and interactive approach (experimental group). Also, two evaluations were made for each group (an initial evaluation and a final evaluation), using the EPIC methodology and semi-structured interviews.

On the initial evaluation of the two groups, one discovered a more reduced availability in expressing ideas from personal initiative, probably correlated with a more reduced ability of precisely and clearly communicating them. Children were especially characterized by:

- dependence on the teacher;
- relatively deduced intensities of the cognitive motivation;
- reduced needs of investigating, experimenting, with preference for the intellectual products already structured by the teacher;
- reduced ability to propose plans – to identify and define objectives, to establish the working procedures and priorities, to mobilize the group in achieving that plan;
- difficulty in spontaneously activating the previous knowledge; difficulty in using in new situations logical schemes and knowledge from the past; difficulty in defining the unknown and in reducing non-familiar to familiar;
- refuse to responsibly run risks; difficulties in offering alternatives, with elements of magical thinking;
- moderated difficulties of working in group, with a lowered availability in negotiating the ideas; children had more judgment-like attitudes, with reduced empathy and a relatively developed critical attitude (they identified much more easily the drawbacks of a solution than its good parts);
- discrete elements of coaching – reduced abilities of being supportive, of supporting the other ones, of guiding them when in difficulty.

The obtained data on the initial evaluation argues the existence of a transmissible-normative model of teaching-learning, which does not valorize / valorize moderately problematization, play with the ideas, autonomy, creativity, abilities of genuine collaboration etc.

As regarding the witness group, comparing the initial results with the final ones, one identifies a discrete effect of becoming mature, in the sense that the pupils seem to have improved a series of abilities (such as, expressing curiosity, a certain spirit of adventure, pleasure to work in group etc.), but these abilities do not reach the desired features by the research team: they manifest curiosity but with difficulty in raising all alone problems; irresponsibly assumed risks; the group seen as a battle field etc.).

Regarding the experimental group, one identifies the following elements:

1. Firstly, the most significant changes seem to have appeared in the collaboration dimension. Thus, children have more developed abilities to work in group, to expose and negotiate their ideas in group; there are more rarely judgments of value, they are more empathic, they have attitudes of active listening.

2. Regarding the coaching abilities, one notices a particular evolution, in the sense that a pupil tends to assume the group leader role and becomes a teacher's substitute, his manner of playing the role being suggestive. Thus children express their expectancies from their teachers: to be supportive, to support them, to guide them when they are in difficulty etc.

3. Regarding the other dimensions of the EPIC graph, the obtained results are more modest, but they clearly illustrate the produced qualitative change. Thus, children are characterized by:

- More increased intensities of the cognitive motivation;
- Expressed needs of investigating, experimenting; one still notices a slight preference for the intellectual products already structured by the teacher / a substitute;
- They have a better capacity of proposing plans (of identifying and defining objectives, of establishing working procedures), but they still have difficulties in establishing priorities, in mobilizing the group;
- One still keeps a certain difficulty in spontaneously reactivating the previous knowledge or in using them in new situations; there still are elements of magic thinking.

Regarding the possible disadvantages of implementing the case study, we retained the following elements:

- objections related to time – lack of time, necessity of respecting the curricula; the interviewed ones consider that this kind of teaching-learning method is attractive but it also consumes time;
- objections related to the insularity character of these educational experiments on the Romanian educational background; others interviewees intuit in these experiences a big potential for changing the Romanian school;
- objections related to the necessity of implicitly changing the initial training of the teachers, with rendering obvious the effects at a certain interval of time;
- objections related to the unpleasant affective moods (insecurity, blocking, regressive attitudes etc.) lived by part of the children, especially by those being more dependant on the teacher.

In conclusion, beyond the identified potential disadvantages, using a creative and interactive approach in teaching-learning Physics in the gymnasium offers the possibility of developing the children's autonomy and creativity.

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