

School Portfolio in Physics for Teaching Electromagnetic Interaction in 9th Grade

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Abstract: *The article views the School Portfolio as a contemporary educational technology which boosts students' motivation for studying and presents their individual accomplishments in a creative way. It offers practical application of the Portfolio in physics in the study of electromagnetic phenomena in the 9th grade. The Portfolio also gives students the chance to enhance the scope of their knowledge of electromagnetism, to self-assess their level of competence in the field and to further develop their knack for physics.*

Keywords: *education in physics, electromagnetic phenomena, educational technology, portfolio, motivation, reflection.*

1. INTRODUCTION

Boosting students' motivation is crucial in carrying out a successful and effective teaching of physics at school. All goals of education are far more easily achieved when students are motivated enough to do their best.

A new contemporary technology to present students' achievements in the field of physics is the School Portfolio. It is a means to make good impression which, in its turn, proves to be a great motivation factor. The main purpose of this device is to give information personal meaning and perspective. In pedagogy the Portfolio has proved to be an effective tool which stimulates teaching, controls and helps measure and assess students' accomplishments. The part of physics they often find so hard to comprehend – Electromagnetic Interaction, is mastered more easily and thoroughly by way of using the School Portfolio technology. Not only does this technology motivate students but it also makes them more curious and willing to achieve thorough grasp of the nature of electromagnetic phenomena.

2. THE SCHOOL PORTFOLIO TECHNOLOGY

The term portfolio came into usage in all pedagogical literature after it had been coined and had circulated in fields like art, photography, business, politics. It first appeared and was used during the Italian Renaissance. Back then portfolio meant the file, the collection, the archive of paintings or sketches artists and architects presented in public. The idea of the portfolio in its original meaning has been used to this day.

In education this technology was first appropriated and used by an American school in the 80s of the XX century. The last few years it has been vastly used by all developed countries all over the world.

The School Portfolio is a compilation of documents and products which attest to the work of the teacher, an educational institution, a student, a university student or a student in a course.

The Portfolio is a contemporary educational technology which reflects the correlation between theory, scientific acquisition and pedagogical practice. The technology itself modifies, reconstructs and reshapes certain theories, principles, approaches and methods, implements knowledge of different scientific fields in practice to ensure the best achievement of some goals of education and upbringing. The Portfolio characterizes the organizational and functional side of pedagogy – from the aims and goals through the contents, methods, tools and conditions to the final evaluation and analysis of results [1].

Creating a Portfolio is an aim in itself which makes every step of education count. Gradually a new culture of studying is established which presupposes and predetermines another kind of relationship teacher - student - parents. It gives way to a new mutual arguing about the criteria for the selection and assessment of the working materials, the rubrics, the design and the final presentation of the product.

The advantages of the Portfolio as an educational tool at school are as follows [2]:

- It compiles and keeps a variety of documents;
- It contains valuable information and examples for future applications in different situations;
- It triggers reflection on the ways of studying and analyzing the results;
- It creates opportunities for self-assessment and personal development;
- It turns the idea of making a long-term plan for the students' future personal development into a feasible option.

According to some sources the advantages of the Portfolio are not in the frantic search for errors but rather in emphasizing students' strengths and pointing out ways and tendencies for their future personal development. Another advantage is the importance the Portfolio may have later in a stu-

dent's life when he/she applies for a university or a job, because the number and volume of the documents it contains give a good enough idea of its author's personality [3].

3. SUGGESTED APPLICATION OF THE SCHOOL PORTFOLIO IN PHYSICS IN THE STUDY OF ELECTROMAGNETIC PHENOMENA IN THE 9TH GRADE

Type of the current Portfolio [4]:

- Of the student documenting the process of studying;
- Graded;
- Paper-based with an additional compact disk (CD) for storing materials electronically.

Goals of the Portfolio:

- Raising the quality and effectiveness of acquiring information about electromagnetic phenomena;
- Following through and documenting the students' progress in studying;
- Assisting reflection on the ways and results of studying electromagnetism.

Suggested Structure of the Portfolio [2]:

- Body – 4 - 8 pages;
- Applications – 8 - 15 (or more) pages.
- **Title page:**
 - *School:* Peyo Yavorov Highschool, Petrich;
 - *Subject:* Physics and Astronomy – 9th grade, general course of education;
 - *Module:* Electromagnetic Interaction;
 - *Name of student:* Ivan Petrov, 9 b class, №12;
 - *Name of teacher:* Georgi Malchev;
 - *School term:* spring term;
 - *E-mail:* ivan_petrov@abv.bg
- **Program extract** [5]:
 - Goals of education for the module “Electromagnetic Interaction”, 9th grade, general course of education;
 - Contents of the Portfolio – a list of materials in alphabetical order with a given number of page where to find them.
- **School working materials:**
 - *TEST 1* – diagnostic test for module “Electromagnetic Interaction”;
 - Computer presentation of the Earth's magnetic field;
 - Photos of a previously made poster on the magnetic field of direct current and electromagnetic interaction;

- Selected photos, sketches and videos of magnetic storms;
- Paper on the life and scientific discoveries of Andre-Marie Ampere;
- Protocol of lab practice “Magnetic Induction”;
- Students’ own bulletin “Electromotors – past, present, future”;
- Scientific essay “Applications of electromotors in engineering and their importance in people’s everyday life”;
- Students’ own videos of ready images, selected video files or exhibition photos all dedicated to the Aurora Borealis;
- *TEST 2* – Revision of the first four units of the Module;
- Scientific essay “Magnetic recording of information and its application in audiovisual and computer technologies”;
- Two class assignments on the unit of solving problems “Inter-action between a magnetic field and moving charges”;
- Computer presentation of electromagnetic induction;
- Three class assignments on the unit of solving problems “Electromagnetic Induction” and one home assignment on the same unit;
- Computer presentation of the structure and way of work of the dynamo;
- Photos of a previously made poster of the quantities characterizing alternating current;
- Computer presentation of electric power transfer;
- Scientific essay entitled “Transformers and their importance in engineering and power engineering”;
- Protocol of lab practice “Learning more about how transformers operate”;
- Two class assignments on the unit of solving problems “Altering current”;
- *TEST 3* – revision test on the last four units;
- Computer presentation of comparing an electric field to a magnetic field;
- Recording a game of electromagnetic interaction;
- Students’ own graphic files of the Paint computer program with drawn induction lines of magnetic fields;
- Photos of students’ own Internet site of electromagnetic phenomena with an address to be found in the global web;
- *TEST 4* – final test to check students’ comprehension and what they have learned from the Module.
- ***Ways of assessing and grading the materials in the Portfolio:***
 - Suggested criteria for grading – pre-negotiated between teacher and students;
 - Other opinions about the students’ Portfolio – opinions written down on paper by other teachers, parents, classmates.
- ***Diary of the course of education (in part “Applications”):***

- *My diary* – comments on the working materials used at school, self-assessment, feedback about the given grades;
- *My favourite part* – a copy of each student's favourite part of the material worked out by him/her.

4. CONCLUSIONS

The basic idea behind the School Portfolio for each and every student can be summed up like this – *I know what I am capable of and I can prove it the best possible way.*

The process of making, presenting and providing relevant argumentation in favour of an author's final product in studying electromagnetism gives establishing control and evaluation of results in physics classes the form and shape of a dialogue, which is priceless. It is a way of fighting conservatism so typical for the traditional diagnostic methods of pedagogy.

A crucial element of the application of the Portfolio of electromagnetic phenomena is the reflection it encourages on the various school materials at hand and on what exactly the student has learned from them. In fact the studying process takes place during the making of the product, not when it is finally presented in public. Thus students' knowledge of electromagnetism enhances and what is measured is students' studying and the development in time of their competences in physics. This in its turn improves students' cognitive, creative and organizational skills, which makes education at school far more appealing, effective and worthwhile.

5. REFERENCES

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