

Fundamentals of Physics in interdisciplinary and transdisciplinary contexts in initial elementary teacher education

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Abstract. Basics of Sciences are subject of teaching learning process in kindergarten and primary school. Future teachers need in initial training not only to master the contents knowledge but also the pedagogical skills to manage the classroom activities. Fundamentals of Physics are very important bricks at the base of natural science and technologies. The paper discuss if really the elementary schools teachers are trained in an interdisciplinary context in which physics concepts and their correct representations play a crucial role and exemplify few best practice in satisfying teachers' needs.

1 Motivation of the Study

In Europe the initial training of future kindergarten and elementary teachers is carried out by accredited institutes and universities. [1] In Romania the specialization is entitled Pedagogy of Primary and Preschool Education. During the programme Mathematics and Applied Didactics of Mathematics detains an important role while Physics is not explicitly mentioned in the curriculum and / or Syllabus description. Other many general and applied didactics of: Romania language and Romanian Literature, Languages and Communication, History, Human and Society, Geography, Musical Education, Environment and Sciences, Physical Education, Fine Arts Education and Practical Skills. To such courses' contents and practical activities in seminars two semesters pedagogical practice in schools 6 hours per week (in total 120 hours) are compulsory.

Sciences and Environment Science and associated Applied Didactics is appreciated with fifth of 120 total ECTS of the Programme. Other 5 ECTS is allocated to Practical Skills and Associate Didactics and is corresponding to the transfer of knowledge and building the competences of future Kindergarten and Elementary Teachers to implement Technological Education of children during elementary school by practical activities. An analysis of the university curriculum in these disciplines demonstrates that the focus is on preparing future teachers to implement the curriculum for primary education that aims to familiarize students with natural phenomena, environment and life science using very general and basic science.

2 Future Teachers Needs Inventory and Educational Intervention

In many Romanian universities because the faculties of education did not really employed experts in Physics, Chemistry, Biology or Engineering etc. the contents are treated superficially not with complex or transdisciplinary representations of concepts and the knowledge, discussions and practice remain at the level of the textbooks and auxiliary supports used in primary classes. The concepts that are built during these disciplines relate to natural phenomenon: Sunlight and Sun's Heat, Earth's Earth Revolution and Seasons, Air, Water, Soil and Subsoil and Their Resources, Relief, Aquatic Environment, Flora and Fauna.

The same thing happens with another discipline called Technological Education and / or Practical Skills. In this discipline in primary education the activities are centered on constructing children's activities on different technical skills as: modeling, collating, puzzling, etc. different materials with artistically or utilitarian purposes as: models, prototypes, sculptures, small cadres, ornaments, etc. Some recommended technics are based on paper work: Origami, Tangram, Collage or works with textile materials: knitting, cutting, cutting, sewing, gluing, etc. And not in the last place basic of Photography.

As can be seen from the list of topics, after an in-depth analysis, most of them are based on basic physics concepts and their representations in an interdisciplinary or transdisciplinary context.

With the intention to identify these concepts and future teacher confidence in basic physics [2-3] knowledge and practical skills based on these and not least to offer training support for teachers, a pedagogical research was developed. The intervention took place in the following steps:

1. In the first stage inquiry methods was used an the instrument was designed to identify the basic physical concepts or macro concepts that future teachers consider important in their practice in classroom. The evaluation tool took the form of guided interview (questionnaire) with foritemes was applied on a number of 120 students of sixth semester of B. Ed. and fourth semester of M.Ed programmes. Simultaneously with the identification of these concepts, the students were asked to asses the degree of trust in the representation of concepts and whether they feel prepared to organize teaching-learning activities mentioning such concepts. In the end of the interview students were asked to suggest seminars' topics and practical activities.

2. Questionnaire analysis and focus group with a seminar group consisting of 20 students who practiced in school institutions led to several modular structures that students wanted to implement in practical activities in schools but based of pre-training done at university both for scholar discipline Sciences and Environment and respectively Practical Abilities.

3. In the third stage these modular structures with the headings:

A. Physical concepts used in interdisciplinary context scientific and technological education and elements of their different level and disciplinary representation.

B. The role of senses in determining substance properties.

C. Air, gases and determination of their properties.

D. Water and its properties. The aquatic environment.

E. Physical and Chemical Properties of the Soil.

F. Elements of monitoring environmental factors and accidental pollution detection.

These modules were implemented in 10 hours of seminar and practical activities.

4. At the end of each activity based on a debriefing, the impact of these activities was assessed after future teachers practiced in classroom with different age and level of class.

5. At the end of the pedagogical practice, students were asked to complete a feedback form focusing on the usefulness of these interdisciplinary modules.

The article will present the stages of the pedagogical experiment extensively.

References

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