Importance of physics in school curriculum – an analysis

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ABSTRACT

Physics is one of the elective subjects in the Key Learning Area of Science Education1. The Physics Curriculum serves as a continuation of the Science Curriculum and builds on the strength of the current Physics Curricula. It will provide a range of balanced learning experiences through which students can develop the necessary scientific knowledge and understanding, skills and processes, and values and attitudes embedded in the strand "Energy and Change" of science education and in other related strands for personal development, and for contributing towards a scientific and technological world. The curriculum will prepare students for entering tertiary courses, vocation-related courses or the workforce in various fields of physical science.

Introduction:

Physics is one of the most fundamental natural sciences. It involves the study of universal laws, and the behaviours and relationships among a wide range of physical phenomena. Through the learning of physics, students will acquire conceptual and procedural knowledge relevant to their daily life. In addition to the relevance and intrinsic beauty of physics, a study of physics also helps students to develop an understanding of the practical applications of physics to a wide variety of other fields. With a solid foundation in physics, students should be able to appreciate the intrinsic beauty and quantitative nature of physical phenomena, and the role of physics in many important developments in engineering, medicine, economics and other scientific and technological fields. Furthermore, learning about the contributions, issues and problems related to innovations in physics will help students to develop a holistic view of the relation of science, technology and society.

The emergence of a highly competitive and integrated economy, rapid scientific and technological innovations, and a growing knowledge base will continue to have a profound impact on our lives. In order to meet the challenges posed by these changes, Physics, like other science electives, will provide a platform for developing scientific literacy and for building up essential scientific knowledge and skills for life-long learning in science and technology.

Curriculum:

The curriculum attempts to make the study of physics exciting and relevant. It is suggested to introduce the learning of physics in real life contexts. The adoption of diverse learning contexts, learning and teaching strategies, and assessment practices is intended to appeal to students of all abilities and aspirations, and to stimulate interest and motivation for learning among them. Together with other learning experiences, students are expected to be able to apply the knowledge of physics they gain, to appreciate the relationship between physics and other disciplines, to be aware of the science-technology-society (STS) connections of contemporary issues, and to become responsible citizens.

The overarching aim of the Physics Curriculum is to provide physics-related learning experiences for students to develop scientific literacy, so that they can participate actively in our rapidly changing knowledge-based society, prepare for further studies or careers in fields related to physics, and become life-long learners in science and technology.

Aims of the curriculum:

The broad aims of the curriculum are to enable students to: develop interest and maintain a sense of wonder and curiosity about the physical world;

- construct and apply knowledge of physics, and appreciate the relationship between
- physical science and other disciplines;
- appreciate and understand the nature of science in physics-related contexts;
- develop skills for making scientific inquiries;
- develop the ability to think scientifically, critically and creatively, and to solve
- problems individually or collaboratively in physics-related contexts;
- understand the language of science and communicate ideas and views on
- physics-related issues;
- make informed decisions and judgments on physics-related issues; and
- be aware of the social, ethical, economic, environmental and technological
- implications of physics, and develop an attitude of responsible citizenship.

Three domains of learning targets:

The learning targets of this curriculum are categorized into three domains:

1. Knowledge and understanding,
2. skills and processes, and
3. values and attitudes.

Through the learning embodied in the Physics Curriculum, students will acquire the relevant learning targets in various physics-related contexts.

- Knowledge and Understanding: Students are expected to: understand phenomena, facts and patterns, principles, concepts, laws, theories and models in physics; learn vocabulary, terminology and conventions in physics; acquire knowledge of techniques and skills specific to the study of physics; group and organise physical knowledge and understanding, and apply them to familiar and unfamiliar situations; and develop an understanding of technological applications of physics and of their social implications.
- Skills and Processes: Students are expected to: develop scientific thinking and problem-solving skills; acquire an analytical mind to critically evaluate physics-related issues; communicate scientific ideas and values in meaningful and creative ways with appropriate use of diagrams, symbols, formulae, equations and conventions, as well as verbal means; acquire practical skills such as how to manipulate apparatus and equipment, carry out given procedures, analyse and present data, draw conclusions and evaluate experimental procedures; make careful observations, ask relevant questions, identify problems and formulate hypotheses for investigation plan and conduct scientific investigations individually or collaboratively with appropriate instruments and methods, collect quantitative and qualitative data with accuracy, analyse and present data, draw conclusions, and evaluate evidence and procedures; and develop study skills to improve the effectiveness and efficiency of learning; and develop abilities and habits that are essential to life-long learning.
- Values and Attitudes: Students are expected to: develop positive values and attitudes such as curiosity, honesty, respect for evidence, perseverance and tolerance of uncertainty through the study of physics; develop a habit of self-reflection and the ability to think critically; be willing to communicate and comment on issues related to physics, and demonstrate an open-mindedness towards the views of others;

be aware of the importance of safety for themselves and others, and be committed to safe practices in their daily life; appreciate the achievements made in physics and recognise their limitations; be aware of the social, economic, environmental and technological implications of achievements in physics; and recognise the importance of life-long learning in our rapidly changing knowledge-based society.

Practical work in the curriculum:

Practical work and investigations are essential components of the curriculum. They enable students to gain personal experience of science through hands-on activities, and to develop the skills and thinking processes associated with the practice of science. Participation in these activities encourages students to bring scientific thinking to the processes of problem-solving, decision-making and evaluation of evidence. Engaging in scientific investigation enables students to gain an understanding of the nature of science and the limitations of scientific inquiry.

Conclusion: To facilitate the implementation of the curriculum, professional development programmes will be organised for physics teachers. Listed below are the major domains of the professional development programmes to be provided. Understanding the rationale and the implementation of the Physics Curriculum; Sharing of learning and teaching strategies and good practices; Latest development in the field of physics (science update programmes); Curriculum management and leadership (curriculum leadership courses); and Internal assessment, School-based Assessment and Standards-referenced Assessment.

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