Exhibit P1.1: Structural Characteristics of the Physics Programs (Tracks)

Reported by National Research Coordinators

Country	Description of How the Programs (Tracks) Fit into the Overall Curriculum	Number of Years Students are Taught in These Programs (Tracks)	Number of Hours of Physics Instruction in Final Year	Criteria for Admission to These Programs (Tracks)	Prerequisites for Admission to These Programs (Tracks)
France	Secondary schooling spans Grades 6–12. At the end of Grade 9 students choose either a vocational program or the general program. Students attending the general program choose among four tracks at the end of Grade 10–technological, literary, economic and social, or scientific. Students choosing the scientific track choose either the engineering sciences or the life and Earth sciences emphasis at Grade 11. At Grade 12, these students additionally choose a specialization among four–life and Earth sciences, mathematics, physics and chemistry, or computational sciences.	2 years	74	Students' skills and attitudes towards science, their grades in mathematics and science, and teachers' and principals' opinions and reports all contribute.	No prerequisites
Italy	Secondary education can last 5 years and is given in three types of schools–lyceums, technical schools, and vocational schools. The students assessed by TIMSS Advanced 2015 are in Grade 13 and have taken an advanced mathematics course or an advanced mathematics and physics course. Most of these students are found in general schools with scientific focus on mathematics and physics (Liceo Scientifico), in general schools with a focus on science, mathematics and physics (Liceo Scientifico opzione Scienze Applicate), or in technical institutes and receiving full-time vocational training.	5 years	86	There are no specific criteria for admission.	No prerequisites
Lebanon	In Grades 1–6 science is merged into one discipline. In Grades 7–12 science becomes separated disciplines–physics, chemistry, and life and Earth science. Students should pass all science exams during the school years to be able to continue science specializations at the university.	6 years	166	There are no specific criteria for admission; all students take physics.	No prerequisites
Norway	The Norwegian students assessed by TIMSS Advanced 2015 completed 10 years of compulsory education followed by 3 years of upper-secondary education. Upper-secondary education is not compulsory. However, all students have the right to an upper-secondary education. Almost the entire cohort enters this level, approximately half of them in an academic track, the other half in vocational programs. All students in the academic track must take a course in natural science in Grade 11. Those who want to specialize in physics choose this subject in Grades 12 and 13, with the courses Physics 1 and Physics 2. The Norwegian students assessed in physics by TIMSS Advanced 2015 were taking the Physics 2 course in their final year of secondary education.	2 years	140	There are no criteria for admission to the subject, but it is recommended to take the most theoretical mathematics course offered at the same time. The Physics 1 course is a prerequisite for the Physics 2 course.	No prerequisites to enroll in Physics 1
Portugal	During lower secondary education (Grades 7 to 9) academic track students have mandatory physics and chemistry courses. After completing lower secondary education (Grade 9) students must enroll in upper-secondary education (Grades 10–12). Only students in the Sciences and Technology academic track can choose the optional 2-year physics and chemistry course in Grades 10 and 11. These students may then enroll in the optional physics and/or chemistry courses in Grade 12. The TIMSS Advanced 2015 target population for physics is composed of the students studying physics in Grade 12.	3 years	98	Admission to the physics course at Grade 12 requires successfully completing the 2-year physics and chemistry course in Grades 10 and 11.	2-year physics and chemistry course in Grades 10 and 11
Russian Federation	All students study physics every year in basic and upper-secondary education. In basic education, all students follow the same curriculum, but in upper-secondary school (Grades 10 and 11), there are two programs: Basic and Profile. The students assessed by TIMSS Advanced 2015 are the Grade 11 students in the Profile physics program, which includes 3 hours or more per week of instruction in physics. These students can be found in lyceums, gymnasiums, special schools for mathematics and physics, and general secondary schools with different profiles at the upper-secondary level.	2 years	90	Although it is not compulsory, it is recommended that students seeking admission to the Profile physics program pass the Basic State Examination in Physics after Grade 9. Schools may ask applicants to pass an interview or oral or written examination in physics.	No prerequisites

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS Advanced 2015

Exhibit P1.1: Structural Characteristics of the Physics Programs (Tracks) (Continued)

Country	Description of How the Programs (Tracks) Fit into the Overall Curriculum	Number of Years Students are Taught in These Programs (Tracks)	Number of Hours of Physics Instruction per Year	Criteria for Admission to These Programs (Tracks)	Prerequisites for Admission to These Programs (Tracks)
Slovenia	Secondary education consists of two types of programs: general gymnasia; and vocational or technically oriented programs. Only the general gymnasia program offers students the possibility of admission to university studies. Students in the fourth year of general gymnasia programs who chose to take an additional physics course in their final year were the target population for TIMSS Advanced 2015.	4 years	105	Completion of elementary schooling.	No prerequisites
Sweden	Upper-secondary education starts at Grade 10 and is divided into 18 national 3-year programs. There are 12 vocational programs and 6 programs preparing for studies at the university level. In Swedish upper-secondary school, Physics is taught in consecutive courses at 3 levels: Physics 1, 2, and 3. Students participating in TIMSS Advanced 2015 completed Physics 1 and 2 (250 credits), or completed Physics 1 and about to complete Physics 2. They all belong to either the natural science program or the technology program in upper-secondary school. Physics 1 is compulsory for all students in these programs. Physics 2 is compulsory for the vast majority of the students in the natural science program. For students in the technology program, Physics 2 is compulsory for one track of the program and optional for students within the other tracks.	3 years	Varying, but approximately 110 on average	Completion of 9-year compulsory school with passing grades in Swedish, English, mathematics, biology, physics, chemistry, and at least six other subjects.	No prerequisites
United States	The physics programs/tracks vary by state and district. All students begin studying science in elementary school with a focus on observation and inquiry and covering basic concepts in the physical, life and Earth sciences. In middle school, science courses are still integrated, but states may place more emphasis on different science subjects across grades (e.g., life science at Grade 6, physical science at Grade 7, and Earth science at Grade 8). In high school, most students begin taking focused courses in specific science disciplines such as biology, chemistry, and physics. The year during which students begin studying physics varies, and generally starts with an introductory physics course in Grade 9 or Grade 10. Students may then progress to more advanced physics courses in Grades 10, 11 and 12, but this is optional. In advanced physics, there are two main programs that are used across many states: College Board's Advanced Placement (AP) Program and the International Baccalaureate (IB) Diploma Programme. Prior to the 2014-2015 school year, the AP physics program included a second-year algebra-based physics course (Physics B) and two third-year calculus-based physics courses (Physics C-mechanics and Physics C-electricity and magnetism). The AP physics curriculum was changed starting in the 2014-2015 school year. Under new guidelines, AP Physics B was replaced by a two-year course sequence (Physics 1 and Physics 2). Physics 1 has no physics prerequisites; Physics 2 must be preceded by either AP Physics 1 or an introductory or honors physics course as a first-year course; and Physics C requires Physics 1, Physics 2 or Physics B, depending on the area of focus (mechanics or electricity and magnetism). The IB physics program is a comprehensive two-year algebra-based physics course sequence that offers two courses, Standard Level (SL) and High Level (HL), for students to choose between. The TIMSS Advanced physics sample includes Grade 12 students who have taken an advanced physics course (AP, IB or another advanced physics course offered by each state/district) in Grade 12 or in a prior grade.	Varies by school and by course	Varies by school and by course	Varies by district and by school	Varies by school and by course

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS Advanced 2015