



Mission 4 - Education and Research

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Mission's main objectives:



Fill the education and skill gap and improve secondary and tertiary education

Develop the growth potential of human capital and the new skills to adapt to technological and environmental challenges, with specific attention to regional gaps. Facilitate access to higher education and encourage investment in tertiary education.



Strengthen the R&D system

Support foundational research and investment in human capital to stimulate and attract scientific talent. Promote a systemic use of the leverage of public and private investments in R&D. Support IPCEI and other international initiatives.



Reinforce Private-public collaboration and support innovation through technology transfer

Promote the systemic use of research results by the economic system. Incentivize companies to strengthen the synergies with the system of fundamental and applied research, to develop and introduce new technologies in the production system. Introduce innovation ecosystems based on a network of applied research institutes, inspired by the best international practices.

Mission's financing snapshot:

M4 - Education and Research

	Resources (euro/mld)				
	Existing	New	Total	REACT-EU	TOTAL NGEU
	(a)	(b)	(c) = (a)+(b)	(d)	(e) = (c) + (d)
M4C1 Enhancement of skills and right to study	2.99	12.38	15.37	1.35	16.72
M4C2 From research to business	1.38	9.91	11.29	0.48	11.77
TOTAL	4.37	22.29	26.66	1.83	28.49

Note: (b) includes existing resources under national FSC, to be devoted to specific measures.

1 M4C1 - Enhancement of skills and right to study

1. Description of the component

Summary box

Policy area: Promotion of the right to study and the fight against early school leaving, digitization of learning processes and tools, improvement of the quality of education and training through retraining, training and selection of teaching staff, closer interaction between skills development and the needs of the productive economy, institutions and culture, policies aimed at increasing the share of young high school and Universities graduates, widespread improvement of scientific and management skills, particularly in the field of digital technologies.

Objectives: The objectives of this component, developed with single proposed projects, are articulated on three axes:

- (i) Access to education and reduction of territorial gaps in the level of education quality (code ACC).
- (ii) STEM skills and multilingualism (code DID).
- (iii) Research and vocational training reinforcement (code KNOW).

Reforms and investments:

Outcome 1: Access to education and reduction of territorial gaps

Investment 1.1: Student housing (code ACC);

Investment 1.2: Scholarships and exemption from school tuition fees (code ACC);

Investment 1.3: Nursery Schools and Early Childhood Education and Care (ECEC) services Plan (code ACC);

Investment 1.4: Upgrading kindergartens (3-6 years) and "spring" classes (from 2 years) (code ACC);

Investment 1.5: Extraordinary intervention aimed at the reduction of territorial gaps in I and II cycles of secondary school. To tackle school dropout (code ACC);

Investment 1.6: Full-time School Fund (code ACC);

Outcome 2: STEM skills and multilingualism

Reform 2.1: Tertiary advanced school (University-Indire) and compulsory training for school managers, teachers, administrative and technical staff (code DID);

Reform 2.2: Reform of teachers recruitment (code DID);

Reform 2.3: Reform to strengthen STEM and digital skills in all school cycles (code DID);

Investment 2.1: Integrated digital teaching and life-long learning of school staff (code DID);

Investment 2.2: STEM skills and multilingualism for teachers and students (code DID);

Investment 2.3: School 4.0: innovative schools, wiring, new classrooms and workshops (code DID);

Investment 2.4: Teaching and advanced university skills (code DID);

Outcome 3: Research and vocational training reinforcement

Reform 3.1: Reform of the tertiary vocational training system (ITS) (code KNOW);

Reform 3.2: Reform of Technical and Professional Institutes (code KNOW);

Reform 3.3: Reform of the "Orientation" system (code KNOW);

Reform 3.4: Reform of Ph.D. Programmes (code KNOW);

Reform 3.5: Enabling university degrees (code KNOW);

Reform 3.6: University degree groups (code KNOW);

Investment 3.1: Development of the tertiary vocational training system (ITS) (code KNOW);

Investment 3.2: Active orientation in school-university transition (code KNOW);

Investment 3.3: Universities and territories cooperation for vocational training (code KNOW);

Estimated costs:

EUR 15,370 million to be covered by RRF (16,720 total NGEU)

M4C1 - Enhancement of skills and right to study

	Resources (euro/mld)				
	Existing	New	Total	REACT-EU	TOTAL NGEU
	(a)	(b)	(c) = (a)+(b)	(d)	(e) = (c) + (d)
1. Access to education and reduction of territorial gaps	1.60	7.40	9.00	0.45	9.45
- <i>Student Housing</i>	-	1.00	1.00	-	1.00
- <i>Scholarships and exemption from school tuition fees</i>	-	0.90	0.90	0.45	1.35
- <i>Nursery schools and early childhood education and care</i>	1.60	2.00	3.60	-	3.60
- <i>Upgrading kindergartens (3-6 years)and spring classes (from 2 years)</i>	-	1.00	1.00	-	1.00
- <i>Extraordinary intervention aimed at the reduction of territorial gaps in I and II cycles of secondary school and tackle school dropout</i>	-	1.50	1.50	-	1.50
- <i>Full-time school fund</i>	-	1.00	1.00	-	1.00
2. STEM skills and multilingualism	1.39	2.73	4.12	0.90	5.02
- <i>Integrated digital teaching and life-long learning of school staff</i>	0.39	0.03	0.42	-	0.42
- <i>STEM skills and multilingualism for teachers and students</i>	-	1.10	1.10	-	1.10
- <i>School 4.0: innovative schools, wiring, new classrooms and workshops</i>	1.00	1.10	2.10	0.90	3.00
- <i>Teaching and advanced university skills</i>	-	0.50	0.50	-	0.50
3. Research and vocational training reinforcement	-	2.25	2.25	-	2.25
- <i>Development and reform of tertiary vocational training system (ITS)</i>	-	1.50	1.50	-	1.50
- <i>Active orientation in the school-university transition</i>	-	0.25	0.25	-	0.25
- <i>Cooperation between universities and territories on vocational training</i>	-	0.50	0.50	-	0.50
TOTAL	2.99	12.38	15.37	1.35	16.72

2. Main challenges and objectives

a) Main challenges

Improving and qualifying the performance of the school and university systems is an essential condition for fostering smart, inclusive and sustainable growth. Italy registers high school dropout rates with important territorial differences (18,80% in the South, compared to 11,70% in the Center North - ISTAT “Italian national statistical institute” 2018 data). This is the result of regional disparities in the quality of the educational

offer coupled with differences in the socio-economic context of students. Even in higher education, dropout rates, albeit slightly down in recent years, remain among the highest in Europe, especially for students that have a technical-vocational school backgrounds. The health crisis caused by Covid-19 has amplified regional and socio-economic gaps existing in Italy, impacting on the accessibility of distance learning, with the probable consequence of greater school drop-out.

Our national education and training systems suffer from structural regional and gender disparities in school results, significant gaps in digital competences of school staff and students, underfunded and understaffed tertiary education. These deficiencies hinder intelligent, inclusive and sustainable growth, prevent the development of human capital and its access and contribution to the productive system. It is necessary to develop advanced skills and an open and dynamic culture, necessary to fully take advantage of the opportunities provided by continuous changes and new challenges related to technological and environmental evolution at national and international level.

Knowledge-based and inclusive development models require the ability to respond, and often to anticipate, a rapidly evolving demand for skills as a result of technological change and emergencies, especially the climate and health ones. In facing these transitions, in particular the digital one, the Italian productive system suffers from a weak demand for skills as well as a scarce supply. The small size of Italian companies limits their ability to interact with universities; at the same time Universities lack flexibility to engage in partnerships with private enterprises to promote research and technological transfer. These conditions add difficulties to the development of an appropriate training system, contributes to the stagnation of productivity and does not increase the ability of enterprises to innovate and compete with the evolving context, characterized by rapid technical progress.

b) Objectives

Investment in human and social capital represent an essential condition for the future of the country. Italy will undertake a strategy that aims at fighting early school drop out in the various training stages, at strengthening the conditions of equity in the education accessibility and in the perception of incentives for educational growth among all categories of the population, according to age, gender, different conditions of ability and territory of residence, overcoming the conditioning stereotypes that weigh in particular on the educational choices of women.

The component is placed in a strategic perspective, distinguished by a systemic approach that covers the entire education and training chain, through a coherent and articulated set of measures that aim at building innovative and resilient education systems for the benefit of future generations.

The goals are linked to the 3 axes in which the component is divided, which show a close coherence with the initiatives of the Commission for the creation of a European

Education Area. In detail:

- Access to education and reduction of territorial gaps (code ACC), is an intervention that aims at extending the right to study to deserving young people, who are in economic and social difficult conditions, by providing them with access to allowances, housing and tax reliefs;
- STEM skills and multilingualism (code DID), aims at improving the quality of competences offered by the educational system, with particular reference to STEM, digital and environmental skills. This axe will allow to increase the attractiveness of different training places, from schools of different levels to universities, offering the development of skills and competences in line with the priorities shared by the European Commission in the document "*Achieving the European Education Area by 2025*". This approach will include a life-long learning program for the upskilling and reskilling of teachers and other school staff, an essential element to improve and innovate the Italian education system.
- Research and vocational training reinforcement ("For a knowledge-based society") (code KNOW), will enhance the role of universities as a driving force for the widespread of knowledge and organizational models to companies and institutions. It will also contribute to strengthening professional training and to relaunching the Vocational Training Institutes (ITS), which offer significantly employment prospects (80% of graduates find work within a year). This line of action includes measures to strengthen active orientation to students in the last two years of high school, in order to increase the number of students enrolled in tertiary education and facilitate the successful completion of study paths.

3. Description of the reforms and investments of the component

1) Access to education and reduction of territorial gaps.

Investment 1.1: Student housing.

Challenges: In Italy, the participation in higher education is not widespread; the percentage of young people who decide to undertake a university course and manage to finish it, is among the lowest in Europe (27,7% of the population 25-34 years, in 2018), with stronger criticalities in some southern regions. The reasons behind this phenomenon are linked both to the accessibility of education for certain social groups and to the degree of diversification of the offered training. Indeed, in Italy the workforce with tertiary education is among the lowest in Europe (19,3% of the population up to 64 years of age against the EU average of 32,3% in 2018). This investment is closely integrated with the "Scholarships and exemption from school fees" project.

Objectives: The measure aims at ensuring a widespread access to quality education regardless of the socio-economic background of students. It aims at adding between

50.000 and 100.000 of sleeping accommodations to the current 40.000, reducing Italy's gap with the EU average (where 18% of students are provided with sleeping accommodations, against the current 3% in Italy). This result will be achieved by covering part of the cost of the residential service for 3 years, at a price that will be negotiated with the property. Students will pay part of the rent, on average equal to a quarter of the cost, but with progression mechanisms based on the Equivalent Financial Situation Indicator (ISEE) of its family of origin.

The initiative is based on the use of leverage mechanisms which generate savings or, alternatively, the possibility of satisfying a higher demand for affordable housing with equal resources committed. It is possible to finance infrastructure interventions proposed by cities by redeveloping deteriorated and unused public buildings to allocate them to student housings. The new residences activated by this mechanism would also become a driving force for the tourist enhancement of urban areas, increasing the number and the quality of accommodation in times when university attendance is not foreseen.

Implementation: The program is managed by the Ministry of University and Research. The implementation of the intervention will be accompanied by a reform of the legislative framework related to university buildings, initially on an experimental basis carried out through Ministerial Decree.

Target population: Students.

Timeline: The measures will start in 2021 and will last until 2025.

Investment 1.2: Scholarships and exemption from school tuition fees (code ACC).

Challenges: In line with the Commission's initiatives to encourage the creation of a European education area, this measures, which is closely integrated with the "Student accommodation" project, responds to the same challenges to promote the increase of tertiary education.

Objectives: This project pursues the integration of contribution policies with policies to support education through:

- no-tax area extension to students coming from families with ISEEs indicator below 23,500 euro;
- scholarships increase to 700 euros;
- scholarships funding for a larger share of members.

Implementation: The program is managed by the Ministry of University and Research. The implementation of the intervention will be accompanied by a Ministerial Decree that will reform scholarships legislation and a Ministerial Decree for the implementation of the tax fee amendment.

Target population: Students.

Timeline: The intervention will start in 2022 and will last until 2024.

Costs: The estimated cost related to the RRF is equal to 0.90 billion euro. This intervention will also benefit from additional resources (0.45 billion euro) allocated in React-EU.

Investment 1.3: Nursery Schools and Early Childhood Education and Care (ECEC) services Plan.

Challenges: For years now, Italy's has shown one of the lowest total fertility rates in the EU (1.29 children per woman in Italy compared with 1.56 in the EU) and a continuous decline in births. The gap between births and deaths is increasing: for every 100 people who die, only 67 children are born (ten years ago, the same figure was 96). Significant territorial differences remain: the drop in the population is concentrated mainly in the South (- 6.3 per thousand inhabitants) and to a lesser extent in the Centre (-2.2 per thousand inhabitants). On the contrary, the population growth process continues in the North (+1.4 per thousand inhabitants). The latest projections on the Italian population estimate a decline from 60.3 million in 2020 to 51.4 million in 2100 (Eurostat, 2019). This process is also expected to be negatively affected by the COVID-19 emergency.

The specific recommendation for Italy (CSR) in 2019 noted that in 2017 only 28.6% of children under the age of three were placed in formal early childhood education facilities. To date, the availability of places in early childhood services is on average 25.5%, 7.5 percentage points lower than the European target of 33%. Moreover, this availability varies significantly at the territorial level: only 10% of children in Calabria attends a nursery school, compared to 47.1% in Valle d'Aosta.

Family care burdens have a significant negative impact on women's employment, especially in the case of mothers of 0-3 children. In order to look after their children, 11.1% of women who have had at least one child in their lives have never worked (the European average is 3.7%). In the South, this figure becomes one in five women. Reconciling work and family life is difficult for more than a third of those in employment (35.1%) who have care responsibilities for children, both men and women. 38.3% of employed mothers result to have made at least one change to their working conditions (e.g. reduced working hours), compared to 11.9% of employed fathers. This percentage rises to 44.9% for employed mothers of children between 0 and 2 years, while for fathers with children in the same age group it is just under 13%. The birth of children also leads to interruptions in women's employment, with the percentage varying according to the number of children (11% in the case of one child; 17% in the case of two children; 19% in the case of three or more children).

Objectives: The intervention is aimed at the construction of new structures and at the

requalification of existing ones for the provision of Early Childhood Education and Care (ECEC) services, so as to reach a national average supply level of at least 55% of nursery places (children aged 0-3), with the creation of about 415,000 new places by 2026.

The achievement of this objective would allow Italy, from the current supply of 25.5%, to exceed the European average (35.1%) and be in line with other Member States such as Spain (50.5%) and France (50%).¹

The objective is considered strategic in relation to the need to:

1. promote the birth rate in the country;
2. encourage female participation in the labour market, ensuring a better work-family balance;
3. invest in the well-being and education of children in their early years, whose socio-economic return is particularly significant.

Implementation: For the purposes of the overall implementation of the project, the available resources of the Fund for nursery schools and pre-school, established at the Ministry of the Interior by the 2020 Budget Law (Article 1, paragraph 59, Law No. 160/2019), will be increased to provide additional and specific funding for the conversion or construction of new early childhood services. This will be followed by the necessary acts to:

1. define the methods and procedures for submitting requests for grants, the allocation criteria and the methods of utilisation of resources, of monitoring, eligibility and evaluation criteria (Ministerial Decree and Public Notice);
2. establish a dedicated Steering Committee, composed of the following subjects: PCM - Department for Family Policies, Department for Regional Affairs and Autonomies, Ministry of the Interior, Ministry of Economy and Finance, Ministry of Education, Ministry of Infrastructure and Transport, as well as an element designated by the Unified Conference; this will be done by Decree of the Minister for Equal Opportunities and Family;
3. select the projects received from the Municipalities, which are the beneficiaries.

Following the publication of the ranking list of those admitted to funding, the beneficiaries will activate procedures to sign the agreements and start the conversion and construction works necessary to the creation of about 400,000 additional places in early childhood services, for the achievement of the average supply level of 55% of nursery places.

Target population: Children aged 0-3; women-mothers of children aged 0-3; potential mothers; families.

Timeline: The duration of the project is estimated in 5 years (till 2026).

¹ See the latest Istat report, available online: https://www.istat.it/it/files//2020/10/REPORT_ASILI-NIDO-2018-19.pdf.

Costs: The estimated cost related to the RRF is equal to 3,6 billion euro.

Investment 1.4: Upgrading kindergartens (3-6 years) and "spring" classes (from 2 years) (code ACC).

Challenges: The demand for childhood education and care - notably in yearly childhood - does not find adequate coverage in terms of quality and quantity, with severe territorial disparities. This slows down women return to their professional life and affects the birth rate decline.

The Enforcement of the 2015 school reform, which integrated education and training system from birth to six years, is aimed at improving the coverage and reducing regional differences. The 2020 budget law and the measures foreseen in mission 5 to be financed by the RRF, strengthen the financial support for families with children in the 0-3 age group who attend an early childhood education and care facilities, nonetheless, further efforts are needed to increase services and facilities quality for children in the 3-6 age group and as well attention to the experimentation of spring classes (from 2 years), a bridge that would help to cope with the inadequate offer for early childhood.

Objectives: The investment project is aimed at the construction, redevelopment and safety of preschools, guaranteeing the quality of teaching through the innovation of the learning environments, with particular strengthening to the experimental sections "spring" (24-36 months) and the constitution of centres for children, as per the legislative decree no. 65 of 2017, by overcoming the dichotomy between early childhood education services (0-3 years) and kindergarten (3-6 years), building a unitary educational path in compliance with the specific characteristics of the two segments. An estimated 33,300 children will benefit from the new kindergartens and 62,500 children will benefit from the upgrading of existing facilities, given the average capacity of 100 children.

Implementation: The program is managed by the Ministry of Education, in collaboration with local authorities and the Presidency of the Council - Family Department.

Target population: Children aged 2-6.

Timeline: The intervention will start in 2021 and will end in 2026.

Costs: The estimated cost related to the RRF is equal to 1 billion euro.

Investment 1.5: Extraordinary intervention aimed at the reduction of territorial gaps in I and II cycles of secondary school. Tackling school dropout (code ACC).

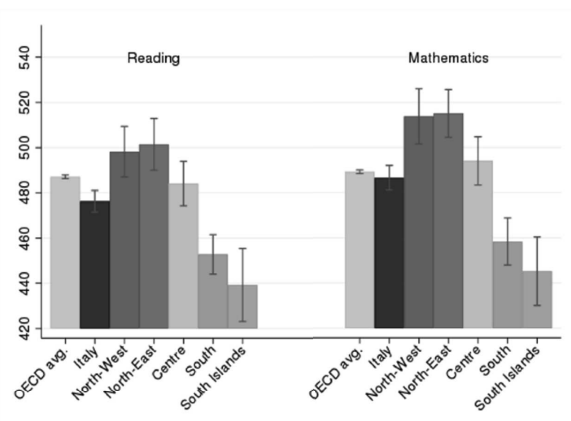
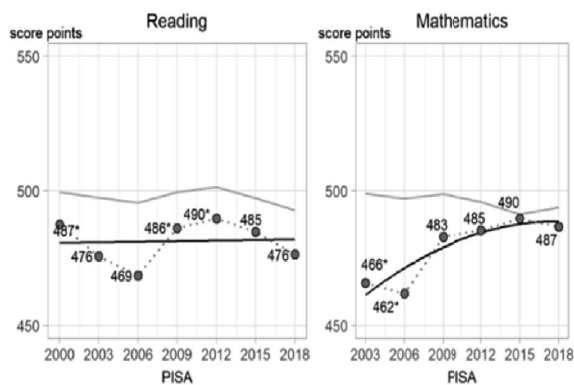
Challenges: National and international researches clearly and unequivocally show that the possession of good basic skills (understanding of the teaching language, mathematics

and English) is a very strong predictor of the educational success of young people. According to the Program for International Student Assessment (PISA), 15-year-old Italian students rank below the OECD average in reading, mathematics and science, with large territorial differences. In the North Italian student rank above the OECD average while in the South rank much lower. Similar evidence - as shown in Figure II 4.1 - occurs for Italian adults, for whom the International Assessment of Adult Skills Program (PIAAC) indicates a constant worsening of results compared to the OECD average.

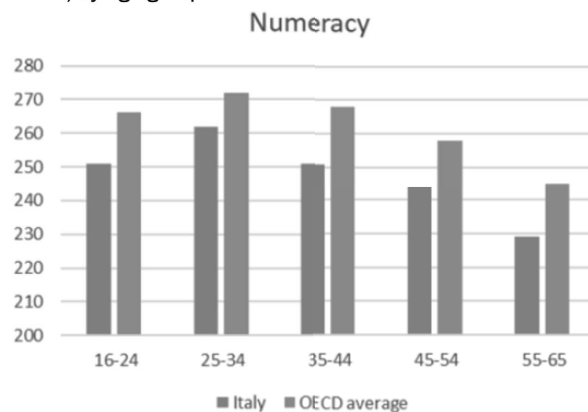
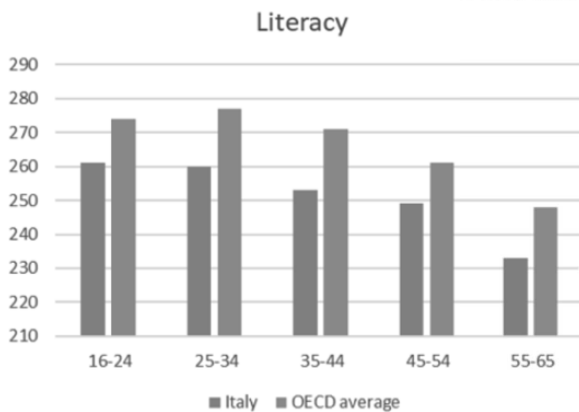
ITALY: BASIC KNOWLEDGE LEVELS IN SCHOOLCHILDREN AND ADULTS ARE WELL BELOW THE OECD AVERAGE

Results on school learning measured by OECD "PISA" tests show a gap for Italy..

... a gap that largely depends on the North-South divide in terms of educational results.



Results of PIAAC tests (2013-16) by age groups



Source: OCSE.

Although the National Guidelines for school curricula already set satisfactory targets to guarantee the achievement of these learning levels, there are still obstacles in reaching a sufficiently large share of students (potentially all students).

Another equally crucial challenge concerns the issue of early school leaving, a phenomenon that can be divided in two different cases: a) students who leave their studies prematurely already in the secondary school period and b) young people who are subject to early school leaving according to the European parameters of the ET2020 strategy (18-24 years).

a) In 2019, the Ministry of Education published the results of a survey on early school leaving according to which the average dropout rate in secondary school is around 3,8% (while it is 1,17% in the primary school). From the Ministry's (MIUR DGCASIS) survey, it is clear that where there are greater inequalities in income, a higher risk of poverty and material deprivation, the dropout rate is high. Likewise, "the inverse link between early school leaving and participation in work is evident, demonstrating the fact that low employment and social exclusion can also have negative impacts on the participation of children in education and training".

b) Early leavers from education and training, formerly referred to as early school leaver, refer to people aged 18 to 24 who have completed secondary education at the most and are not involved in further studies or training. The indicator "Early leaving from education and training" is expressed as the percentage of people aged between 18 and 24 who find themselves in this situation compared to the total population aged between 18 and 24 years; According to Eurostat, the dropout rate for Italy is 14,5%. (above the ET 2020 parameter which by 2020 should not have exceeded 10%)

Objectives: A plan is envisaged for the enhancement of basic skills which, starting from the analysis of students outcomes that shows large gaps within the Country, will be developed over 4 years with the goal of guaranteeing adequate basic skills for at least 1.000.000 students per year, also through the development of a single national portal for online training. Particular attention will be paid to schools that have experienced greater difficulties in terms of performance - thus customizing interventions on students need - where there will be a support intervention by the school manager with external tutors as well as, in the most critical cases, the availability of at least one additional staff unit per subject (Italian, Mathematics and English) and for a minimum of two years. In particular, mentoring and training actions (even remotely) are envisaged for at least 50% of teachers and the strengthening of the number of teachers (4) and experts (2) for at least 2000 schools. A pilot project to be carried out in the first semester of 2021 will be financed by the PON school funds already available.

In order to develop a strategy to structurally fight early school leaving and since the investment on basic skills is strongly linked with the need of prevention (basic skills gaps are among the main causes of early school leaving), the project also defines intervention and compensation measures. In this sense, the project includes an investment specif-

ically aimed at fighting early school leaving, promoting educational success and social inclusion, with specific programs and initiatives for mentoring, counselling and active and vocational guidance that prevent premature abandonment of studies already in the period of secondary school (about 120.000 students to be involved) and make it possible to reduce the phenomenon of early school leaving to the European parameters of the ET2020 strategy (age group 18-24, about 350.000 young people to be involved). In particular, for situation a) (age group 12-18), online mentoring will be aimed both at young people at risk and at those who have already dropped out, with a teacher / student ratio equal to 1:1 for interventions of support and recovery of learning for a total of 20 hours each (3h of mentoring and 17h of teaching). To this end, teachers from the class or school attended, or even from other schools, chosen by the children themselves, will be involved according to their willingness to take on the position. The additional commitment for teachers would be carried out beyond ordinary working hours, for a maximum of 6 hours per week, payable as additional teaching activities (with the option – depending on teachers' choices – of partial or total relief of contribution charges). As for situation b) (age group 18-24), the support activities consist of 10h of mentoring, or consulting interventions aimed at reintroducing the young person into the training circuit.

Finally, the project also aims at promoting social inclusion and ensuring Integrated Digital Education for students with disabilities or living in disadvantaged areas.

Implementation: The program is managed by the Ministry of Education; INVALSI, schools. Territorial Support Centers (Centri Territoriali di Supporto, CTS) will also be involved in the implementation of the measures for students with disabilities or living in disadvantaged areas.

The actions envisaged have a structural effect that goes beyond the time horizon of the RRF, since the reduction of the dispersion of training outcomes is achieved through the increase in the teaching and methodological skills of teachers. These skills will be consolidated within the teaching system, which will benefit permanently. The structural nature of the project is also measured by the reduction of territorial disparities in basic skills, with positive repercussions that would occur over time even at the highest levels of education

Target population: Schools, students, young people who have abandoned their studies.

Timeline: The intervention will start in 2021 and will last until 2024.

Costs: The estimated cost related to the RRF is equal to 1,5 billion euro.

Investment 1.6: Full-time School Fund.

Challenges: To be completed... .

Objectives: The "school time" will be increased to expand the training offer and to help reconcile the life and work times of families, and especially of women. This initiative is closely integrated with preschools strengthening (3-6 years) and "spring" sections (from 24 to 36 months).

To be completed...

Implementation: The program is managed by the Ministry of Education.

Target population: School students, professors, school staff and families.

Timeline: To be completed... .

Costs: The intervention is financed by RRF with 1 billion euros. Additional 300 million will be provided through PON projects.

2) STEM skills and multilingualism.

Reform 2.1: Tertiary advanced school (University - INDIRE) and compulsory training for school managers, teachers, administrative and technical staff (code DID).

Challenges: The continuous professional updating of school staff (managers, teachers and the administrative and technical staff) is crucial to ensure that the education of new generations proceeds in line with the challenges imposed by rapid changes. It is also essential for the efficiency of the overall school system. With regard to the multiple strategic and highly complex functions exercised by school managers in the context of school autonomy, they require periodic updating for the management of complex systems and emerging issues. On the other hand, teacher training constitutes the decisive lever for improving the national education and training system. Considering the rapid evolution of society, it is a priority to ensure pedagogical and didactic training which, together with in-depth disciplinary knowledge, allows to effectively address cultural and digital challenges and to provide high quality teaching. The professional condition of teachers records an inadequate enhancement of the training programs envisaged by the National Plan for Digital Schools and by the National Teacher Training Plan, a fragmentation of the training objectives and discontinuity of the training modules and, finally, low participation rate to continuous in-service training courses. Finally, the Administrative, Technical and Auxiliary Personnel (personale amministrativo, tecnico e ausiliario, ATA) suffer from the absence of a constant professional training consistent with technological progress and with regulatory changes. ATA in-service training is also characterized by an inadequate definition of the programs within the Three-year Plans of the Training offer pursuant to art. 1 paragraph 12 of Law 107/2015.

Objectives: The reform aims to build a quality life-long learning system for school staff in line with a continuous professional and career development through the establishment of a tertiary advanced school and the compulsory nature of in-service training for school

staff, linked with career progressions. Although in-service training is already mandatory under Law 107/2015, Article 1, paragraph 124, it has not been implemented as it did not provide for quantification (in terms of hours). The reform will establish the “Unità Formative” system as the subject of the specific legislative provision and of the next national collective labour agreement.

Implementation: The program is managed by the Ministry of Education. For the purpose of the reform, INDIRE - today a research body under public law, pursuant to article 19 of the decree-law of 6 July 2011, and in accordance with Article 2, paragraph 4 of the Statute, has the goal of “taking care of the in-service training of school staff, in close connection with the processes of technological innovation, through accompanying activities and professional retraining both in presence and in e-learning mode” - will be perform new functions, which will require a remodulation of the three-year plan of activities referred to in Article 3 of the Statute.

Target population: School staff.

Timeline: The intervention will start in 2021; the promulgation of the law is expected in 2022; the full implementation of the reform will take place by 2025 with the finalization of the related investment project sub 8.

Costs: The estimated cost related to the RRF is equal to 0,034 billion euro.

Reform 2.2: Reform of teachers recruitment (code DID).

Challenges: The current system for new teachers’ recruitment needs a thorough review to ensure the required professionalism of school staff. The related reform will strengthen the impact of investments described above and will enable more qualified teachers to educate young people on how to face future job-related challenges. Moreover, the current selection system does not guarantee students adequate access to knowledge, relational and methodological-learning skills.

Objectives: The reform, structural in nature, aims at establishing a new system for the recruitment of teachers and has the strategic objective of improving the quality of our national education system. Particularly, in addition to the current public competition procedures, the measure foresees that aspiring teachers spend one year in further training and evaluation, and only after their successful completion the selection process will be completed. This innovative methodology will allow to recruit teachers on the basis of their level of knowledge as well as on the basis of the teaching methods acquired and their ability to relate to the educative community.

It useful to remind that the current system already includes a sort of training and evaluation period, with methodological training on-line and educational internship, at the end of which the new teacher is merely "confirmed in the role" by the Evaluation Committee.

In this sense, the selection and recruitment phases coincide, where confirmation in the role is a pro forma procedure. The reform proposed aims instead to separate selection and recruitment. After passing the Exam Competition (selection phase), the candidate will enter the training system that will lead him, after carrying out an ad hoc course (with renewed characteristics of selectivity, also with regard to the vocational dimension to the profession) to the definitive recruitment. The methodological training path will be strengthened and at the end of the training course and only after the evaluation (by the evaluation committee at the level of the individual school institution) the candidate will be formally placed in the role.

Implementation: The program is managed by the Ministry of Education.

Target population: Teachers to be hired.

Timeline: The regulatory process will be launched in 2021; it is expected to publish the first public competition applying the innovative selection method in 2023, once the reformed law has been promulgated.

Costs: The estimated cost related to the RRF is equal to 0.

Reform 2.3: Reform to enhance teaching of STEM and digital skills in all school cycles (code DID).

Challenges: The ongoing social transformations and their repercussions on the economy require specific changes in training courses in order to structure a school capable of acting as a builder of attitudinal orientation (free from gender stereotypes), and as a key player in the national social context. According to the latest PISA report (2018) on school readiness of 15-year-old students, Italy shows significant gaps compared to the OECD average in scientific literacy (468 points vs. 491 on average), advanced critical reading skills (5% vs. 9% for all OECD countries) and financial literacy. Another gap regards gender: the average score of 15-year-old males in mathematics is equal to 494 points against 479 points for females (-16). In science, the gap is equal to 3 points (470 points for males vs. 466 for females). In relation to the future prospects of Italian top performers in science and mathematics, 26% of males and only 12,5% of females imagine themselves working in science or engineering at the age of 30, while the 10,7% of males and 22,7% of female students imagine a career in the health sector.

Italian companies demand for skilled workers is estimated in at least 469.000 people in the next 5 years. They will probably need to look at foreign markets to meet their demand for technicians and professionals in technological, scientific and economic fields. Current orientation practices are inadequate and ineffective as they are anchored to an obsolete vision of work. The system suffers an overall difficulty in creating enough technological and social innovation, and adequate training in the scientific field. The lack of STEM

and digital competences, for which Italy is among the European countries with the worst results, constitutes one of the main limits for the Country's development and for its recovery from the current crisis.

Objectives: The regulatory reform intervention consists in the integration, among curricular disciplines, of activities, methodologies and contents designed to develop and strengthen - with a full interdisciplinary approach - STEM, digital and innovation skills, for all school cycles, starting from kindergarten to secondary school. The reform aims at guaranteeing equal opportunities in terms of access to scientific, technological, engineering and mathematical careers.

Implementation: The program is managed by the Ministry of Education.

Target population: Male and female students.

Timeline: The intervention will start in 2021 and the legislative act is expected to be promulgated in 2022; the full implementation of the reform will take place with the finalization of the related investment project 11 described below.

Costs: The reform costs are equal to 0.

Investment 2.1: Integrated digital teaching and life-long learning of school staff (code DID).

Challenges: The continuous professional updating of the entire school staff (managers, teachers and the administrative and technical staff) is crucial to ensure that the training of new generations proceeds in line with the challenges imposed by rapid changes - not only technological - as well as for the efficiency of the overall school system. The challenges that the investment project wants to meet are therefore those already indicated in the related reform project sub 7 (Tertiary advanced school (University - INDIRE) and compulsory training for school managers, teachers, administrative and technical staff).

Objectives: The project envisages the creation of a system for the continuous professional development of all school staff with targeted training interventions for 300.000 recipients, based on a survey of their professional updating needs. In particular, training actions are envisaged for teachers, school managers, administrative and technical staff. The project is also aimed at implementing a digital system for the recording of experiences and training activities (professional portfolio) and creating of a balance of skills and training actions for improvement. All the 8.000 schools on the national territory will be involved in the project and will implement the training activities envisaged by the national planning. The digital system sofia.istruzione.it will allow the monitoring and national governance of the project.

Implementation: The program is managed by the Ministry of Education in collabora-

tion with schools.

Target population: School staff.

Timeline: The intervention will start in 2022 and will last until 2025.

Costs: The estimated cost related to the RRF is equal to 0,42 billion euro.

Investment 2.2: STEM skills and multilingualism for teachers and students (code DID).

Challenges: The challenges that the investment project takes up are those already indicated in the related reform project sub 2.3), with a focus on multilingualism, an equally strategic challenge for new generations to fully achieve a European citizenship, promoting intercultural contamination through the mobility of students and teachers. The National Institute for Documentation, Innovation and Educational Research (INDIRE) has allocated approximately 38 million euros for the in-service training of school staff and approximately 90 million euros for partnership projects between schools for students' mobility in the framework of the current Erasmus 2014-2020 program. This allocation covers only about 40% of the demand. On the other hand, the Erasmus+ Program represents an excellent investment in human capital with a relatively fast "return" for society. All the surveys and analysis in recent years show that those who participate in this project acquire skills that can be rapidly used in their careers. For example, an impact study conducted by the European Commission in 2019 shows that 80% of university students with international mobility experiences are able to get a job within 3 months of graduation. The same study reveals that 40% of students who did an Erasmus traineeship received a job offer from the host company, while 75% developed a strong spirit of self-employment and therefore the idea to start a business.

Objectives: The intervention consists in the integration, among curricular disciplines, of activities, methodologies and contents designed to develop and strengthen STEM, digital and innovation skills, in all school cycles, starting from kindergarten to secondary school, and with a full interdisciplinary approach. The intervention aims at guaranteeing equal opportunities and gender equality in terms methodological approach and STEM orientation activities. This initiative aims to encourage up-skilling and re-skilling processes in digital education and to the full integration of such methodologies in current school curricula:

- "Digitalisation and Innovation", for the development of computer science skills that are necessary for the school system and play an active role in the transition towards jobs of the future;
- STEM, for the development of training programs and a culture oriented to scientific disciplines (science, technology, engineering and mathematics) especially for female students in order to promote equal opportunities in sectors still characterized by

male over-representation.

Another objective is the activation of skills development/enhancement program, in cooperation with the business sector, in order to support teachers and schools in the training and research activities for improving the students' educational and employment success rate.

Furthermore, a national program for sustainable orientation is envisaged to bridge young people's expectations to socio-economic transformations, promoting equal opportunities in terms of access to scientific careers.

Finally, the project aims at strengthening multi language skills in students and teachers through a series of actions. Among these, a widening of consulting and information programs on Erasmus+ with the support of the Erasmus+ National Institute for Documentation, Innovation and Educational Research (INDIRE) and its ambassadors' network. In particular, the project is expected to pursue:

- activation of courses to increase language skills for students through curricular activities for kindergarten, extra-curricular activities for primary school and lower secondary school and a period of study abroad for students of the upper secondary school (through an initial grant of scholarships for the first year);
- the internationalisation of the Italian school system by investing in incoming mobility;
- language and methodological courses for teachers.

A digital system will be developed to monitor language skills at national level with the support of respective certifier entities.

Implementation: The program is managed by the Ministry of Education, in cooperation with the Department for Equal Opportunities of the Presidency of the Council of Ministers for the reinforcement of STEM and digital skills and the orientation activities for young women. In the implementation phase, schools will also be involved. As for the strengthening of multi language skills, the National agency INDIRE will be involved.

Target population: Schools, students and teachers.

Timeline: The intervention will start in 2022 and will last until 2025.

Costs: The estimated cost related to the RRF is equal to 1.1 billion euro.

Investment 2.3: School 4.0: innovative schools, wiring, new classrooms and workshops.

Challenges: Text... .

Objectives: The intervention aims at promoting and enhancing school digitalization, creating innovative learning environments, digital upgrading of school organization, in-

cluding wiring of school in order to improve connectivity, the supply of innovative and advanced tools in classrooms for digital teaching; in secondary schools, it is foreseen the activation of workshops for new professions connected with artificial intelligence, robotics and digitalization, also favouring the collaboration between public and private sectors. The intervention will be designed to reduce territorial gaps in the access to technologies by all school institution.

Implementation: Text... .

Target population: Text... .

Timeline: Text... .

Costs: The estimated cost related to the RRF is equal to 2.1 billion euro.

Investment 2.4: Teaching and advanced university skills (code DID).

Challenges: Emerging economic and social challenges for the future (primarily, environmental sustainability and digital diffusion) require adequate training courses consistent with the skills demanded by society and the labour market. In this perspective, Italian universities and the education system, in general, must be the driving force for the widespread adaptation of knowledge and organisational models to the continuous advancement of technology.

In line with the initiatives to contribute to the creation of a European education area and with the Action Plan for digital education (2021-2027), measures aimed at rethinking education and training for the digital age, at encouraging international openness and cooperation, and at promoting the dissemination of the culture of innovation, assume particular importance.

Objectives: The project aims at qualifying and innovate university (and doctoral) programs, through the levers of a) digitisation; b) “culture of innovation”; c) internationalisation, acting:

- on the promotion of open-access digital training courses of excellence, synergistic between universities and businesses;
- on strengthening the role of Superior Graduate Schools for high-merit and cutting-edge training in a new dimension of strong collaboration with universities and the business world, contributing to the dissemination of the culture of innovation;
- on the strengthening of scientific cooperation, on the circulation and attraction of talents, stably structuring training programs abroad, defining programs to support strategic partnerships to innovate the international dimension of the Italian university system, funding initiatives for the internationalisation of research.

Implementation: The program is managed by the Ministry of University and Research,

which will constitute a control room for the effective management of the sub-measures, enhancing the synergies.

Target population: Students, university.

Timeline: The intervention will start in 2021 and will last until 2026.

Costs: The estimated cost related to the RRF is equal to 0.50 billion euro.

3) Strengthening research and vocational training.

Reform 3.1: Reform of the tertiary vocational training system (ITS) (code KNOW).

Challenges: The Vocational Training Institutes, (*Istituti Tecnici Superiori - ITS*), structured as “Participatory Foundations”, create forms of integration between public and private resources (private companies constitute over 43,1% of the associate partners) and are very relevant in decentralised governance contexts, universities / scientific and technological research centres, local authorities, schools and training systems highly specialised technical and technological training. The ITS activate job-oriented tertiary courses to train technicians who manage highly complex systems and processes, mostly digitised, paying particular attention to the integration between design, technologies and organisation, in six articulated areas: Energy efficiency; Sustainable mobility; New technologies of life; New technologies for the Made in Italy (Business services, Agri-food system, Home system, Mechanical system, Fashion system); Innovative technologies for cultural heritage and related activities; Information and communication technologies. The ITS are distinguished from other educational channels as they are mainly focused on employment opportunities, being able to guarantee to the 83% of their graduates a job one year after graduation (92% of cases compatible with the followed curriculum) linked to the real demand of the labour market (ITS national monitoring, Indire 2020). They represent a different training model capable to intercept the real need for new competences required by the production system. They offer teachers with direct experience in the labour market (70%), internships (43%), hours of theory carried out in business and research laboratories (25,5%). With educational modalities (locations and timing) designed according to the technological areas. ITS graduates particularly appreciate these courses, even though data on ITS enrolments (7.831 enrolled in courses launched in 2019, Indire) show that the goal of structuring a reliable channel of vocationally oriented tertiary education, competitive with the University, remains to be achieved. Often despite high demand from the labour market, the “technical training” option appears to be a second choice. Alongside this critical element, there is one more factor: to date, 11% of ITS seem to need improvement actions; some of them fail to provide educational paths continuously, thus giving families an image of an unstructured training channel. ITS have always obtained a negative result in the 2015-2020 monitoring and given their location and structural difficulties, they are more exposed to the social and economic impact of the crisis.

Objectives: The reform is intended to strengthen the tertiary vocational training system by extending the organisational and teaching model to other training contexts (supporting the training offer, introducing rewards and widening the paths for the development of enabling technological skills - Enterprise 4.0). It will also put Vocational Training Institutes in the legal system of job-oriented Tertiary Education and rebalance the quality of the connection with the entrepreneurs' network in the regions.

Implementation: The program is managed by the Ministry of Education.

Target population: Vocational Training Institutes (ITS), students.

Timeline: The process will start in 2021; the Promulgation of the rule is expected in 2022. The implementation is linked to the investment project 15.

Costs: The estimated cost related to the RRF is equal to 0.

Reform 3.2: Reform of Technical and Professional Institutes (code KNOW).

Challenges: The current system of Technical and Professional Institutes offers training programmed which are now obsolete with the needs of the labour market, as well as disconnected from the territories. As a consequence, the social and economic impact of the crisis is deepened by an insufficiently prepared human capital unable to face the challenges of the labour market and to contribute to the Country's development and innovation.

Objectives: The reform project of the Technical and Professional Institutes aims to invest in human capital in a targeted and specific approach tailored to the geographical, economic and social conditions of the territory, with direct short- and long-term benefits on the country's growth potential, as well as the promotion of new entrepreneurial settlements, to foster employment and development. The reform aims at orienting Technical and Professional institutes towards the innovation output of the National Industry 4.0 plan as well as the profound digital innovation in place in all sectors of the labour market. The high quality of the offered curriculum will encourage the graduates' employability thanks to the adoption and harmonisation of training programmes according to the needs of each territory and the labour market.

Implementation: The program is managed by the Ministry of Education.

Target population: Technical and Professional Institutes.

Timeline: The process will start in 2021; the Promulgation of the rule is expected in 2022. Full implementation is expected in 2025 through accompanying actions.

Costs: The estimated cost related to the RRF is equal to 0.

Reform 3.3: Reform “Orientamento” (code KNOW).

Challenges: According to UNICEF’s October 2019 report, based on ISTAT data, in Italy of young adults in the 15-29 years age class, 2,116,000 are NEET (*Not in Education, Employment, or Training*), equal to a share of 23.4% of young people present on the territory (in Sicily the share is as high as 38.6%, in Calabria 36.2% and in Campania with 35.9%). Among the more than 2 million NEET, 38% are aged 20 to 24 years².

In this context, “Orientation” is not only just a tool for managing the transition between school, higher education and labour market but also a lasting value in the life of each person, ensuring development and support in decision-making processes to promote active employment, economic growth and social inclusion.

Objectives: The regulation will introduce orientation modules - not less than 30 hours per year - in upper secondary schools (for students in the IV and V years) in order to promote increased levels of education. It will also create a digital orientation platform, related to the tertiary educational offer of Universities and Vocational Training Institutes (ITS), easily accessible by young students. The proposal favours the growth potential by targeting the most fragile front of the young population, subject to the risk of dispersion and unemployment in the future, preventing the NEET phenomenon. The proposal also promotes growth potential by investing in the creation and development of human capital in line with the actual demands of the labour market.

The proposal goes in the direction of supporting other investments in a strategic approach (to fight early school leaving and gender gap in STEM disciplines, to strengthen ITS, ecc..).

Implementation: The program is managed by the Ministry of Education.

Target population: Students in the iv and v year of upper secondary schools.

Timeline: The process will start in 2021; the Promulgation of the rule is expected in 2022.

Costs: The estimated cost related to the RRF is equal to 0.

Reform 3.4: Reform of university degree groups (code KNOW).

Challenges: Society and economic trends show that the current disciplinary classifications are obsolete and that in various scientific fields the prevailing organisational models of universities and institutions is inadequate. The growing complexity requires constant assessment between different disciplines, and the new educational paradigms should en-

² In details: 49% of them have obtained a secondary school diploma, while 40% have completed a lower cycle of education while 11% hold a university degree.

hance more advanced, transversal and multidisciplinary skills.

Objectives: The reform foresees the removal of constraints in the definition of credits to be assigned to the different disciplinary areas, in order to allow the construction of teaching systems that strengthen multidisciplinary skills, on digital technologies and environmental field, as well as on soft-skills. The reform will also be extended to job-oriented degree classes.

Implementation: The program is managed by the Ministry of University and Research.

Target population: University professors, researchers and students.

Timeline: The reform will be implemented through D.M. to be adopted in 2021, for the application of updated teaching regulations starting from the academic year 22/23.

Costs: The estimated cost related to the RRF is equal to 0.

Reform 3.5: Reform of Ph.D. Programmes (code KNOW).

Challenges: An economy and a society built on knowledge imply an enhancement of the role of the Ph.D. programme, that must provide an adequate training to undertake a university career or high-level activities in firms or public institutions. Ph.D. graduates need to contaminate the ruling class of the Country, in the private and in the public sector, stepping out of the boundaries of the academic world, promoting knowledge and expertise spill-over which are usually built in the university environment, contributing to the capabilities of the productive system to innovate and compete.

Objectives: The reform will update the regulation on Ph.D. programmes, simplifying the procedures for the involvement of companies, research centres, national and international, in Ph.D. programmes. The proposed reform has clear integrations with all the investments related to Ph.D. programmes in the target domain “Education and research”.

Implementation: The program is managed by the Ministry of University and Research.

Target population: University professors, researchers and students.

Timeline: The reform will be presented with the Ministerial Decree, which is currently under preparation, and ultimate in 2021, becoming effective for the cycles that will start in 2022.

Investment 3.1: Development of the tertiary vocational training system (ITS) (code KNOW).

Challenges: The proposed project allows full implementation of the xiv) reform to strengthen the education offer of Vocational Training Institutes, inspired by models es-

tablished in other European countries. By working in networks with companies, universities/scientific and technological research centres and local authorities, the education and training system will reduce Italy's significant backlog in non-academic tertiary training, as will reduce the mismatch between the demand and the supply of work that is at the root of much youth unemployment.

Objectives: The project intends to increase the educational offer of Vocational Training Institutes, enhancing their supplies and logistics needed and increasing the participation of the enterprises in the educational processes. In particular, the project aims at significantly increasing the number of ITS and at strengthening laboratory structures (introducing innovative technologies 4.0); it will also invest in enriching teachers' competences. The goal is to increase the number of enrolled students in ITS (+100% min-currently there are 15.000) and consequently the number of graduates (currently 8000 per year). Furthermore, it is foreseen to activate a national digital platform that allows students to know the job offers for those who obtain a professional qualification. The proposal helps to reduce the skills mismatch, by offering training opportunities with high standards and adapted to the promotion of the competitiveness of the country's economy in relation to the innovations of Enterprise 4.0 and the twin transitions. The implementation of new training courses and the dissemination of innovative training model would also enhance a fully specialized training chain linked to the Energy 4.0 and Environment 4.0 areas and therefore functional to the adaptation of 4.0 skills to strategic development sectors.

Implementation: The program is managed by the Ministry of Education with Vocational Training Institutes for its fulfilling.

Target population: Vocational Training Institutes (ITS), young people, students.

Timeline: The intervention will start in 2021 and will last until 2025.

Costs: The estimated cost related to the RRF is equal to 1.5 billion euro.

Investment 3.2: Active orientation in school-university transition (code KNOW).

Challenges: In line with reform 3.3, it is appropriate to implement actions of active orientation to connect youngsters with the academic world, also through the reinforcement of specific teachings, to increase the awareness as well as the motivation to grasp economic and social opportunities of higher education.

Objectives: The project aims at elevating the transition from secondary school to university and, at the same time, tackling university dropouts in the following years, contributing to laying the foundations to reach the strategic goal of increasing the number of university graduates. The measure contributes to the qualification of the education system through a rise in the success indicators (school attendance, improvement of learning