

Increasing achievement and motivation in mathematics and science learning in schools

Eurydice report

Jean Monnet (6+4) Youth Higher education Vocational education and training Adult education

c1= b+d

0

Erasmus+ Enriching lives, opening minds.

INPUT

ThocEss

OUTPUT

School education

European Educatio and Culture Executive Agency

CHAPTER 2: TEACHING AND LEARNING IN THE CONTEXT OF THE COVID-19 PANDEMIC

The daily reality of schools across Europe was strongly affected in 2020 and 2021 by the COVID-19 pandemic, which led to school closures in many countries and periods of distance or blended learning (combining online and classroom-based learning) for many students. Many schools were ill-prepared for this unprecedented situation. They did not know which technologies and methodologies were the most appropriate for teaching, in terms of effectiveness, security and accessibility (Cachia et al., 2021). Teachers had to rapidly adapt to new modes of delivery of teaching, in which they had not necessarily been trained; and students had to rely initially on their own resources to continue learning remotely using textbooks, the internet, television, etc. (Schleicher, 2020).

Some students who had a supportive home environment, characterised by, for example, a high level of support from parents, a quiet space to study and the necessary digital devices, reported learning gains in some areas, such as in the use of technologies and in transversal skills such as creativity, problem-solving and communication (Cachia et al., 2021). However, a number of reports and studies point to the lack of effective formal teaching during this time and the resulting learning losses (Cerna, Rutigliano and Mezzanotte, 2020; Di Pietro, Biagi and Costa, 2020; Hanushek and Wößmann, 2020; Wößmann et al., 2020). For example, a study on schools in the Flemish Community of Belgium over a period of 6 years (2015–2020) found a significant learning loss for students in the 2020 cohort. The study suggests that school closures led to a decrease in average scores in mathematics and Dutch compared with the previous cohort (Maldonado and De Witte, 2022).

Moreover, the pandemic was found to have exacerbated existing educational inequalities. Students with low educational attainment, those from disadvantaged backgrounds, those who did not have access to digital learning resources and those with learning difficulties or lacking the resilience to learn on their own, faced substantially more obstacles in the context of distance learning (Cachia et al., 2021). Studies have highlighted the detrimental effect that school closures and distance learning have had on these students, including in mathematics (Engzell, Frey and Verhagen, 2021; Grewenig, Lergetporer, Werner, et al., 2021; Hanushek and Wößmann, 2020).

This evidence of negative effects prompted the European Commission to table a proposal for a Council Recommendation on blended learning for high-quality and inclusive primary and secondary education, adopted by the Council in November 2021 (²⁷). The Council Recommendation forms part of the response to lessons learned from the COVID-19 pandemic, which highlighted many pre-existing challenges and inequalities. It recommends short-term measures to address the most pressing gaps observed so far and outlines a way forward in terms of blending learning environments and tools that can help build more resilient primary and secondary education and training systems.

This chapter highlights some general aspects related to the impact of the COVID-19 pandemic on schools during the 2020/2021 school year (the reference year of this report), before the next chapter returns to the analysis of mathematics and science education. The first section presents the organisation of school education during this school year (i.e. it looks at when schools were open, closed or provided distance and/or blended learning). It then outlines the variation in the digital preparedness of schools before the pandemic in Europe. Finally, the main actions taken by top-level education authorities to support the digital capacities of schools and teachers are described. These actions include providing recommendations/guidelines on digital education, supporting continuing

⁽²⁷⁾ Council Recommendation of 29 November 2021 on blended learning approaches for high-quality and inclusive primary and secondary education 2021/C 504/03. OJ C 504, 14.12.2021, p. 21–29.

professional development (CPD) for teachers and providing additional funding where digital infrastructure, connectivity or devices were lacking.

In addition to these general aspects, the pandemic had effects on some specific elements of school education that relate to mathematics and science teaching, which will be discussed in the following chapters. Chapter 4 discusses the changes to certified examinations and national tests in mathematics and science in 2020/2021. Adjustments to the provision of learning support in mathematics and science are presented in Chapter 6.

2.1. The organisation of school education during 2020/2021

In order to understand the extent of school closures and their potential impact on teaching and learning in schools, including in mathematics and science, this section investigates the organisation of schooling during 2020/2021. Figure 2.1 presents the number of months – between September 2020 and June 2021 (i.e. 10 calendar months) – during which European education systems kept schools open or closed – with or without the possibility of distance learning – or offered the option of blended learning (see Annex II, Figure 2.1A, for further information per country). Distance learning means that teaching and learning occur entirely remotely (from home), whereas blended learning combines online learning opportunities with traditional classroom-based methods.



Source: Eurydice.

Explanatory notes

The figure presents the number of months during which European education systems applied the indicated forms of school organisation during the 2020/2021 school year (except July and August, i.e. the main summer holiday months). See Annex II, Figure 2.1A, for a breakdown by calendar month and for further country-specific information.

The figure shows that, in Europe, schools remained largely open during the 2020/2021 school year. However, only Spain, Finland, Switzerland, Iceland and Liechtenstein kept schools open for classroom-based learning for all grade 4 and grade 8 students throughout the entire year. In Sweden, schools were as well kept open, but school organisers were given permission to switch to blended or distance learning in some cases. In most other education systems, schools had to adapt their usual teaching and learning practices by switching to distance learning and/or blended learning for some of the school year. Complete school closures due to the pandemic were rather rare and of relatively short duration. Variations between countries in the total duration of the school year are mainly due to longer school holidays during the school year or the summer holidays starting already in June.

Distance learning was the second most common form of school organisation. It was used in grade 4 and/or grade 8 for a duration of less than a month in France, Hungary and Malta, and for 5 months or more in Czechia, Greece, Italy, Lithuania, Poland, North Macedonia and Turkey. This mode of learning from home was used in slightly more education systems and for slightly longer for grade 8 students than for grade 4 students. This raises concerns about the older students' school careers, social development, and mental health and well-being (Viner, Russel, Saulle, et al., 2022).

Around one third of the education systems opted for blended learning as the dominant form of school provision, either instead of or in addition to a period of distance learning for all students. This applied in grade 4 and/or grade 8 for less than a month in Poland and Montenegro, and for more than 5 months in Croatia and Serbia. Overall, like distance learning, blended learning was implemented in more European education systems and for longer periods in grade 8 than in grade 4.

Finally, schools were rarely entirely closed (i.e. without the provision of even distance learning). Complete closure occurred only in Belgium, Germany, Ireland, Greece, Portugal, Romania, Montenegro, North Macedonia and Turkey. However, the closures generally lasted for a short period (1–2 weeks), and they mainly took place immediately before or after school holidays.

2.2. Digital preparedness of primary schools before the COVID-19 pandemic

Numerous European policy initiatives have been encouraging schools and teachers to take advantage of digital technologies for school management as well as for teaching practices (²⁸). The Trends in International Mathematics and Science Study (TIMSS) administered by the International Association for the Evaluation of Educational Achievement (IEA) provides some information on school digitalisation levels just before the COVID-19 pandemic (in 2019). Two aspects are worth highlighting: firstly, the extent to which schools were already implementing online learning management systems and, secondly, the availability of computers for student use in schools. Although both reflect levels of school digitalisation, the use of online learning systems relates more to teacher familiarity with or acceptance of technology (Dindar et al., 2021), whereas the student–computer ratio may indicate the extent of the digital infrastructure available to students.

^{(&}lt;sup>28</sup>) See, for example, Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning, OJ L 394, 30.12.2006, p. 10; Council Recommendation of 22 May 2018 on key competences for lifelong learning, OJ C 189, 4.6.2018, p. 1; and Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the digital education action plan, COM(2018) 22 final.

TIMSS data reveal that, in 2019, approximately half of grade 4 students in participating European countries attended schools that used an online learning management system to support learning (see Figure 2.2). The availability of such systems in schools does not necessarily imply that teachers and students were engaging in distance education before the pandemic. It is more likely that the systems were used for the digital management of grades, student access to course materials, teacher–student communication, etc. The availability of an online learning management system can serve as an indication of school digital competence (Pettersson, 2018). Such competence facilitates acceptance of digital technologies and their integration into school processes (Blau and Shamir-Inbal, 2017; Dindar et al., 2021).

At least 90% of students attended schools with an online learning management system in Latvia, Sweden, Hungary, Finland, the Netherlands, Lithuania and Denmark. In these countries, schools may have been better prepared for the sudden switch to distance teaching and learning. For example,

According to evaluations (²⁹), schools in **Finland** were able to use the digital infrastructure that existed before the COVID-19 pandemic, as well as digital tools and learning environments, reasonably well. Two factors proved particularly important. Firstly, since 2016, the government had been funding a network of tutor teachers, which proved essential for teachers' preparedness for distance teaching during the pandemic. Secondly, since 2015, national authorities have been supporting the 'computers for everyone' initiative, which collects donated used computers and supplies them to schoolchildren and students (³⁰).

In contrast, the proportions of students attending schools with an online learning management system were considerably lower in Albania, France, Germany, Cyprus, and Bosnia and Herzegovina. In these countries, before the COVID-19 pandemic, only 15–30% of grade 4 students were enrolled in schools that used an online management system to support learning.



Figure 2.2: Percentage of fourth graders whose school used an online learning management system to support learning before the COVID-19 pandemic, 2019

Source: Eurydice, based on the IEA TIMSS 2019 database.

Explanatory notes

Education systems are depicted in ascending order.

The proportion is calculated based on school principals answering 'yes' to question 9 (ACBG09) of the TIMSS survey 'Does your school use an online learning management system to support learning (e.g., teacher-student communication, management of grades, student access to course materials)?' Standard errors are available in Annex III.

'EU' comprises the 27 EU countries that participated in the TIMSS survey. It does not include participating education systems from the United Kingdom.

^{(&}lt;sup>29</sup>) Pennanen et al. (2021); Vuorio et al. (2021) (English abstract on p. 9). See also a <u>factsheet from the Finnish Board of Education</u> and a case study by the <u>Association of Finnish Municipalities</u>.

^{(&}lt;sup>30</sup>) <u>https://www.kaikillekone.fi/</u>

The availability of digital devices such as computers and tablets in schools provides some insight into student familiarity with digital learning environments. Figure 2.3 shows the distribution of fourth graders per computer in schools before the COVID-19 pandemic.

Before the pandemic, most schools in Europe had a certain number of digital devices available for use by fourth grade students. The most common situation, applying to 36.9% of students in the EU, was one computer being shared by more than two but fewer than five students. Moreover, 23.4% of students attended schools with one digital device available per more than one but fewer than two students. Such schools may have had some dedicated computer classrooms that were used by different classes for teaching certain subject areas. It is rather difficult to determine individual students' levels of familiarity with digital learning environments, but it is likely that many of them had some exposure to computers and the internet at school.

The survey data indicate that there was at least one digital device for every student for 17.3% of fourth grade students in the EU in 2019. These students may have had access to a computer or a laptop during any lesson, including in their own classroom. The best digitally equipped education system is in Malta, where at least one computer or tablet was available for 94.8% of students. In Denmark, Sweden and Norway, this was the case for 65–70% of fourth graders.

By contrast, very few students (fewer than 5%) had individual access to computers at school in Turkey, Albania, Austria, Cyprus, Italy, Portugal, Serbia and Montenegro. High proportions of students did not have any access to digital devices at school in Albania (46.5%), Turkey (33.3%) and Croatia (27.4%). Students and teachers in these schools may have experienced considerable challenges when the COVID-19 pandemic interrupted classroom-based learning.



Source: Eurydice, based on the IEA, TIMSS 2019 database.

Ratio (students per computer)	EU	TR	AL	AT	СҮ	IT	PT	RS	ME	DE	HR	BA	BG	FR	PL
≤1	17.3	2.1	2.6	2.7	3.2	3.6	4.2	4.6	4.7	5.7	5.7	7.2	12.5	12.8	15.9
> 1 and \leq 2	23.4	3.5	5.6	10.8	14.9	18.1	13.9	7.4	5.3	20.2	13.0	17.0	27.3	18.1	31.3
$> 2 \text{ and } \le 5$	36.9	13.8	11.6	25.5	36.5	49.7	23.7	31.5	24.2	44.2	19.1	23.3	40.9	45.9	37.2
> 5	18.5	47.3	33.7	57.2	42.8	24.7	54.7	42.0	53.4	25.0	34.8	33.0	16.4	18.2	15.6
No computers	3.8	33.3	46.5	3.8	2.6	3.9	3.5	14.5	12.4	4.9	27.4	19.5	2.9	5.1	0.0
	MK	BE nl	LV	IE	LT	ES	HU	CZ	SK	FI	NL	NO	SE	DK	MT
≤1	19.7	20.6	21.1	22.8	24.6	24.7	27.9	29.0	42.0	50.0	52.5	65.7	66.5	69.5	94.8
> 1 and \leq 2	26.3	32.7	24.3	30.8	29.7	31.9	27.3	46.5	32.3	31.6	19.5	20.5	19.5	13.9	1.5
$> 2 \text{ and } \le 5$	34.3	32.5	35.2	30.1	32.4	29.8	23.5	22.9	21.3	16.4	12.8	13.8	11.2	13.4	1.1
> 5	18.2	14.2	18.2	14.9	10.8	7.4	13.9	1.0	3.6	1.3	15.2	0.0	1.6	1.7	2.6
No computers	1.6	0.0	1.3	1.4	2.5	6.2	7.5	0.6	0.7	0.8	0.0	0.0	1.2	1.5	0.0

Data (Figure 2.3)

Explanatory notes

Education systems are depicted in ascending order based on percentage of students who have at least one computer available at school.

The calculations are based on two questions from the TIMSS school questionnaire. The response to question 2 (ACBG02) -'What is the total enrolment of fourth grade students in your school?' – was divided by the response to question 7 (ACBG07) – 'How many computers (including tablets) does your school have for use by fourth grade students?' When question 7 indicated 0 ('no computers'), the ratio was not calculated. In such cases the table shows the proportion of grade 4 students attending schools with no computers. Standard errors are available in Annex III.

'EU' comprises the 27 EU countries that participated in the TIMSS survey. It does not include participating education systems from the United Kingdom.

2.3. Top-level digital responses to the COVID-19 pandemic

As per the previous section, and according to a number of research reports (Cachia et al., 2021; Graaf et al., 2021; Zancajo, Verger and Bolea, 2022), there was considerable variation in digital skills, equipment and learning resources among schools in European countries at the start of the COVID-19 pandemic. In many places, the sudden shift to distance learning served as an important push towards digital acceleration in education. Some countries took the opportunity to advance already planned reforms, and others started to revise curricula and teaching plans in order to strengthen the digital aspects of the syllabus.

In **Belgium (Flemish Community)**, the *digisprong* plan builds on the immediate response to the COVID-19 crisis. A relaunch fund of EUR 375 million was awarded for ICT support for schools in 2021 (compared with annual ICT investment of EUR 32 million in 2019). The plan aims to create a future-oriented and secure ICT infrastructure for all compulsory education schools; a strongly supportive and effective ICT school policy; ICT-competent teachers and teacher trainers; and adapted digital learning resources. Investments are being made in the necessary framework for schools, including strengthening the role of ICT coordinators, developing digital services, and establishing a knowledge and advice centre for schools. The plan also includes various actions to provide high-quality digital teaching materials, with attention paid to cybersecurity and tackling cyberbullying (³¹).

Figure 2.4 reveals that education systems across Europe tackled the challenges presented by the COVID-19 pandemic with new guidance, teacher training and allocation of additional funding. Numerous training courses and guidance materials regarding how to organise distance teaching and learning were provided. Many additional resources were directed at schools, teachers and students to ensure the necessary digital infrastructure, connectivity and digital devices existed, as well as to enhance teachers' digital skills and competences. Only six European education systems have seen no changes to top-level recommendations, continuing professional development (CPD) or funding concerning digital resources in primary or lower secondary schools since the start of the COVID-19 pandemic.

^{(&}lt;sup>31</sup>) <u>https://onderwijs.vlaanderen.be/nl/directies-en-administraties/organisatie-en-beheer/ict/digisprong</u>



New guidelines or recommendations on how to organise distance teaching and learning were issued in 29 of the 39 education systems analysed. In most of these cases, the country's ministry of education launched a dedicated website for all information related to COVID-19 measures in schools, provided recommendations on delivering education remotely and provided numerous digital learning resources. A few countries (e.g. Portugal and Montenegro) also sent printed recommendations on the implementation of distance teaching to all schools.

In **Czechia**, several new methodological recommendations for different school types and education levels have been issued: 'methodical recommendations for distance learning' (³²), 'recommendations for distance learning and mental health' (³³), and pedagogical recommendations for the return of pupils to schools' (³⁴). These recommendations focus predominantly on the procedures for adapting teaching to the needs of pupils, methods to help pupils who did not participate in distance learning and rules for evaluation.

The Lithuanian National Agency for Education issued a detailed 'distance learning and teaching manual', which summarises recommendations and methodological suggestions to prepare schools for possible new outbreaks of COVID-19, application of blended/distance learning in the future, as well as new teaching methods and their proper implementation (³⁵).

The website of the Hungarian Educational Authority published recommendations on a number of digital teaching methods (36).

The **Austrian** Federal Ministry of Education, Science and Research created a dedicated platform 'distance learning – all information for teachers, students and parents' and the 'digital school' portal to simplify communication between teachers, learners and parents (³⁷).

In March 2020, the **Polish** Ministry of Education and Science launched an education portal that contains various digital teaching materials and tools, a guide for schools on how to secure personal data during distance learning and a guidebook for headteachers and teachers on how to act in the context of temporary limitations on the operation of education system units (³⁸).

Portugal created the 'support to schools' website in 2020. It provides a comprehensive set of resources to support learning and school management, in order to enrich and enhance the teaching and learning process during this challenging time. It includes guiding principles for the implementation of distance learning in schools; guidelines on the use of technologies to support distance learning; guidelines on the work of ICT resource centres (focusing on the evaluation and prescription process); and guiding principles on pedagogical assessment in distance learning (³⁹).

The **Romanian** Ministry of National Education launched an information portal (⁴⁰) that includes methodological guidelines for all levels of education.

⁽³²) <u>https://www.edu.cz/wp-content/..</u>

³³) <u>https://www.edu.cz/methodology/..</u>

^{(&}lt;sup>34</sup>) <u>https://www.edu.cz/methodology/...</u>

^{(&}lt;sup>35</sup>) <u>https://www.emokykla.lt/...</u>

^{(&}lt;sup>36</sup>) <u>https://tudasbazis.ekreta.hu/...; https://moodle.up2u.kifu.hu/; https://www.oktatas.hu/kozneveles/...; https://www.oktatas.hu/pub_bin/...</u>

^{(&}lt;sup>37</sup>) <u>https://www.bmbwf.gv.at/Themen/schule/beratung/corona/corona_fl.html</u>

^{(&}lt;sup>38</sup>) <u>https://www.gov.pl/web/zdalnelekcje; https://www.gov.pl/web/edukacja-i-nauka/zdalne-nauczanie-uodo; https://www.gov.pl/web/edukacja-i-nauka/informator-dla-dyrektorow-szkol-i-nauczycieli</u>

^{(&}lt;sup>39</sup>) <u>https://apoioescolas.dge.mec.pt/</u>

⁽⁴⁰⁾ https://educatiacontinua.edu.ro/

Digital competences were already part of the initial education and CPD of teachers in many European countries (European Commission / EACEA / Eurydice, 2019). However, the need for training in the use of an online learning environment, distance teaching tools, digital learning materials and remote assessment methods increased when schools were not able to provide classroom-based learning due to the COVID-19 pandemic. The majority of European education systems systems (29 out of 39) reported allocating more top-level support to address the deficit in teachers' digital skills and competences.

In Czechia, several webinars, newsletters, websites and videos on how to use digital learning resources were provided for teachers (41).

In Estonia, thematic online seminars were organised for teachers (42).

In Spain, in the call for network training courses for teachers for 2020/2021, specific courses related to distance teaching were included, for example distance teaching, design of learning experiences for distance education, evaluation of learning in distance education mode and the online tutor (43).

In Poland, a number of training courses aiming to improve teachers' distance teaching skills were continued or launched (44).

Top-level authorities in 27 European countries provided additional funding to acquire the lacking digital infrastructure, connectivity and digital devices for schools, teachers and students. This funding was to be used for connectivity, computers, tablets, accessories (docking stations, microphones, cameras, etc.), software, platforms and other related equipment or services. Several countries released additional funds for vulnerable students.

The Greek Ministry of Education provided a voucher worth EUR 200 per pupil/student from families that fulfilled certain financial criteria for the purchase of an electronic device for the pupils/students (tablet, laptop or desktop computer). This applied to 560 000 people aged 4-24 years.

Since the first quarter of the 2020/2021 school year, schools in Spain have lent up to 500 000 electronic devices with internet connection to the most vulnerable students to enable distance learning. This was financed by the central government through a EUR 16 000 million COVID-19 fund for the autonomous communities (45).

In Italy, urgent measures linked to the COVID-19 pandemic included additional financing of EUR 85 million aimed at the 'purchase of devices and individual digital tools for the use of integrated digital teaching activities, to be granted to less well-off students, also in compliance with the criteria of accessibility for people with disabilities, as well as for the use of digital platforms for distance learning and for the necessary network connectivity' (46).

To ensure that all students have the digital infrastructure necessary for distance learning, the Federal Ministry of Education, Science and Research in Austria procures notebook computers and tablets to be loaned, for a limited period, to secondary school students on the basis of need. The initiative is being implemented in ongoing close coordination with and with the support of the education directorates and school authorities (47).

In Poland, in April 2020, the Ministry of Education and Science launched a call for local governments to purchase ICT equipment needed by schools, teachers and students for the purpose of distance education. The remote school co-financing programme released PLN 150 million (approximately EUR 33 million) from the European Regional Development Fund under the digital Poland operational programme for 2014-2020. 90% of local governments applied for and received individual grants, ranging from PLN 35 000 to PLN 100 000 (approximately EUR 7 000 to EUR 22 000). The procedure was shortened and simplified, so that schools could quickly acquire the necessary equipment (48).

https://koronavirus.edu.cz

https://www.harno.ee/oppetoo-kriisi-ajal#veebiseminarid

https://www.boe.es/diario_boe/txt.php?id=BOE-B-2021-5947

https://lekcjaenter.pl/; http://www.doskonaleniewsieci.pl.

https://www.lamoncloa.gob.es/consejodeministros/resumenes/Paginas/2020/160620-cministros.aspx

Art. 21 of Decree-Law 137/2020.

 $[\]binom{44}{4^{4}}$ $\binom{45}{4^{6}}$ $\binom{47}{4^{8}}$ https://www.bmbwf.gv.at/Themen/schule/beratung/corona/corona_fl/endgeraete.html

https://www.gov.pl/web/cyfryzacja/zdalna-szkola-rekordowe-tempo; https://ose.gov.pl/aktualnosci/...

The analysis of digital responses to the COVID-19 pandemic indicates that most measures were general and not subject specific. New digital learning materials and television and radio programmes in mathematics and science were created, but no specific COVID-19-related guidance in these subject areas was reported.

Summary

This chapter provided a brief insight into the impact of the COVID-19 pandemic on the organisation of school education and some of the consequent policies and measures implemented by European education systems to strengthen digital teaching and learning.

Schools across Europe remained largely open during the 2020/2021 school year, although almost all education systems had to switch to distance learning and/or blended learning for some of the school year. Complete school closures were rather rare and of relatively short duration (generally immediately before or after school holidays). Both distance learning and blended learning were used more in grade 8 than in grade 4, leading to concerns about the older students' school careers and overall well-being.

Overall, the rapid shift to distance or blended learning revealed large differences in the levels of digitalisation between countries as well as between schools, teachers and learners. Survey data reveal that in 2019, most schools in Europe had a certain number of digital devices available. However, in the EU, 18.5% of grade 4 students were enrolled in schools where at least five students had to share one computer. In addition, 3.8% of students had no access to computers at school whatsoever. Before the pandemic, an online learning management system was used in approximately half of schools.

Top-level authorities in almost all European education systems responded with new measures to upgrade digital resources and address competence gaps. Guidelines for schools and teachers concerning distance teaching and learning were drafted and published on the websites of ministries of education or on dedicated information portals. Additional top-level support was allocated to address teacher-training deficits. Moreover, top-level authorities provided considerable public resources to strengthen the digital education infrastructure and schools' technological resourcing. Several countries reported targeted funding to provide digital devices to disadvantaged students.

It should be noted, however, that the changes presented here were not the only ones. In addition to these and other general adjustments made in response to the COVID-19 pandemic, many education systems decided to adapt certain aspects of teaching and learning that are directly related to mathematics and science teaching. Changes were made, for example, to certified examinations and national tests in these subjects and to the provision of learning support. These aspects will be addressed in later chapters of this report (Chapters 4 and 6 respectively).