



LITERACY ACQUISITION IN GERMAN OR FRENCH IN THE PILOT PROJECT “ALPHA - ZESUMME WUESSEN”

FIRST LONGITUDINAL ÉPSTAN RESULTS OF STUDENT CHARACTERISTICS,
ACHIEVEMENT, MOTIVATION, AND PARENTAL SUPPORT

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“Without data, you’re just another person with an opinion.” – W. Edward Deming, Data Scientist

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EXECUTIVE SUMMARY

- To deal more adequately with the **high linguistic diversity of the student population** in Luxembourg and to encounter educational inequalities that presumably result (at least in part) from a curriculum that places high language expectations on students, the Luxembourgish government has launched the **literacy pilot project “ALPHA - zesumme wuessen”** in the 2022/23 school year in four primary schools in pre-primary education (Cycle 1.2). This project allows students at the beginning of primary education (Cycle 2.1) to start literacy acquisition in French (ALPHA-French students) or German (ALPHA-German students) based on the assumption that literacy acquisition is facilitated when students learn to read and write in a language linguistically closer to their home language(s).
- With the Luxembourg School Monitoring Data (ÉpStan) collected in autumn 2025/26, the first cohort of the project “ALPHA – zesumme wuessen” students that were already assessed in Cycle 2.1 within the ÉpStan in 2023/24 and for which first results were presented by researchers from the Luxembourg Centre of Educational Testing (Colling et al., 2024) in June 2024, have now been assessed in Cycle 3.1 (two years later), which allows to **monitor students’ academic outcomes over time**. The **aim** of this report is thus, to empirically examine the **developmental trajectories** of this first cohort, who started their primary education in the scope of “ALPHA - zesumme wuessen”.
- Based on the research design and methodology of the first ALPHA report (see Colling et al., 2024), the 2025/26 ÉpStan data allow to analyze **academic achievement and motivation as well as parental support** of ALPHA-French and ALPHA-German students both compared to the full cohort of students at the national level as well as to their respective statistical reference groups consisting of students with comparable background characteristics (e.g., gender, socio-economic status - SES, language, and migration background) created via propensity score matching to allow fair comparisons. Apart from the ALPHA-French students, the other four groups started literacy acquisition in German.
- Regarding **grade retention** (i.e., *allongements de cycle*), the first longitudinal results indicate that the rate is slightly lower in the ALPHA-French group (17 %) compared to the ALPHA-French reference group (24 %), but largely comparable to students at national level (14 %). The ALPHA-German group shows a grade retention rate of 20 %, which is similar to the retention rate in the ALPHA-German reference group (18 %).
- When it comes to **academic achievement** in mathematics, as well as in listening and reading comprehension in the students’ language of literacy acquisition (i.e., German or French), the results indicate that students from all five groups show comparable competences in these

academic key domains (with group differences below 10 %¹) irrespective of their language of literacy acquisition.

- The ÉpStan results furthermore show that the majority of all students in Cycle 3.1 reported a high **academic motivation** (in mathematics and their respective language of literacy acquisition). It can, however, be noted that students in the ALPHA-German group expressed a higher academic motivation in mathematics, whereas the ALPHA-French group reported a higher academic motivation to learn in their language of literacy acquisition (French) when compared to the other groups with differences particularly pronounced when compared to the ALPHA-French reference group (with German as language of literacy acquisition).
- In addition, **academic wellbeing** is also high across all five groups. Whereas ALPHA-German students reported a higher academic wellbeing than their peers in all other groups, it becomes apparent that ALPHA-French students expressed a lower wellbeing compared to the other four groups.
- Looking at **parental support** based on the parents' own language skills in their child's language of literacy acquisition, parents in the ALPHA-French group reported a higher capacity to support their child academically compared to parents from the ALPHA-French reference group; a difference that becomes particularly visible when it comes to supporting the child in its' language of literacy acquisition.
- Taken together, the results from the ÉpStan 2025/26 thus show that students at the beginning of Cycle 3.1 have on average **comparable academic achievement** in mathematics and their language of literacy acquisition and a generally **high academic motivation** and this irrespective of their language of literacy acquisition.
- Although international research findings suggest a facilitation of literacy acquisition when learning in a language linguistically closer to the home language background, this **advantage is currently not reflected in the ÉpStan results**. ALPHA-French students, who learn to read and write in French, show comparable achievement results across all key domains when compared to students from the ALPHA-French reference group who learn to read and write in German.
- One **potential explanation** for the fact that this advantage can currently not be observed in the ÉpStan data might be that literacy acquisition in French (i.e., an opaque language) differs from literacy acquisition in German (i.e., a transparent language), which influences the **pace and the visibility of the students' learning progress**. A further explanation might lie in the amount of **exposure to the language of literacy acquisition**. Luxembourgish has a prominent standing in the pilot project as it is the main language of communication in the classroom and of verbal instruction in side subjects. This can be seen as an asset in our highly diverse student population; however, it might come with a trade-off related to achievement in their language of literacy

¹ The only exception has been observed for ALPHA-German students in reading comprehension at level 2 compared to students at the national level, which cannot be considered a systematic difference as it does only appear in one achievement test and at one level.

acquisition. This is particularly relevant in light of international research showing that exposure time to the target language is crucial for learning development.

- Due to **important statistical and methodological limitations, the present results need to be interpreted with caution.** The most considerable limitation thereby lies in the very small sample size of students participating in the pilot project and that they are not comparable to the general student population in Luxembourg. Due to this small sample size, the current French language tests cannot be scaled on the established ÉpStan metric, which implies that it cannot be determined whether the German and French language test versions are conclusively comparable in empirical difficulty.
- In order to be able to draw definite conclusions on the impact of the pilot project on students' learning development as well as on the possible reduction of educational inequalities by this broader language offer, **encompassing further research with larger and more representative samples is needed.** In this context, the hypothesis that literacy development shows a different pace in French than in German and thus may become only apparent at later stages in the context of the ÉpStan (e.g., beginning of Cycle 4) and thus needs to be investigated in follow-up studies with larger samples. Besides such a longitudinal large-scale monitoring, more fine-grained complementary tests and research designs (e.g., assessing reading skills at more frequent time points in individual settings) are needed.
- Overall, it should be noted that the present findings do not offer any insight into **how the current results would generalize beyond the specific conditions of the pilot project.** Aspects such as the student population (e.g., language background), the intensity and structure of instructional support (e.g., collaboration network between pilot schools), the motivation, experience and training of teachers (e.g., didactical specificities of teaching literacy acquisition in French), as well as the broader classroom and school environment (e.g., pilot schools characterized by a lower mean SES than schools at national level), may differ considerably in other contexts or at a larger national scale.

1. INTRODUCTION

Luxembourg has a highly socioculturally and linguistically diverse population, which is reflected in the national education system with a high percentage of primary (68 %) and secondary school students (66 %) speaking a different language than Luxembourgish at home (SCRIPT & MENJE, 2024). Although **this diversity is a great asset, national and international research** (e.g., PISA) **has repeatedly identified important educational inequalities between student groups based on their background characteristics** (Boehm et al., 2016; Hadjar et al., 2018; Hornung et al., 2021) in Luxembourg's multilingual education system.

These inequalities have once again been confirmed by national findings presented in the most recent *National Education Report* (LUCET & SCRIPT, 2024). By longitudinally following a full student cohort throughout primary education (from C2.1 to C4.1), the Luxembourg School Monitoring Programme "Épreuves Standardisées" (ÉpStan; see section 2.1) found that a higher share of students with a low socio-economic status (SES) and students speaking another language than Luxembourgish/German at home fail to achieve the national education standards (i.e., *Niveau Socle* defined by the Ministry of Education, Children and Youth in the *Plan d'Études*; MENFP, 2011) both in mathematics and in German reading comprehension compared to high-SES students and students with a Luxembourgish/German home language background (Ottenbacher et al., 2024). Additionally, studies focusing on the acquisition of German language skills within the Luxembourgish regular school system found that differences in favour of students speaking Luxembourgish and/or German at home arise already in early primary education (Hornung et al., 2024; Tremmel et al., 2024). These findings underscore the importance of a high exposure to the language of instruction (Carroll, 2017) and targeted language activities to strengthen vocabulary and oral language skills including listening comprehension from an early age on (Marulis & Neuman, 2010; Muter et al., 2004; Thomas et al., 2020; Wright & Cervetti, 2017) with the aim of enabling all students to fully develop their academic potential regardless of their language background.

Indeed, language development studies show that children's oral language skills in the language of literacy acquisition, including vocabulary knowledge, are important predictors of later literacy acquisition (e.g. Muter et al., 2004). At the start of literacy acquisition, children's cognitive resources are used to link phonemes to graphemes for reading and vice versa for writing, whereas only limited capacities are available for reading comprehension. Through regular practice, this process becomes increasingly automated, and children are able to recognize more and more words directly. As a result, additional cognitive resources are gradually freed up and can then be used for reading comprehension.

Acquiring literacy skills at school is particularly challenging for (multilingual) children who speak languages at home that differ from the one used for instruction. Learning to read and write in a

language other than the home language places additional cognitive and linguistic demands on the child, who must acquire new vocabulary and syntactic structures, alongside early literacy skills. Most children who speak other languages at home than the language of instruction thus acquire language comprehension and reading comprehension skills simultaneously, whereas children who are proficient in the language of instruction can draw on this prior linguistic knowledge when learning how to read and write.

Research shows that **proficiency in the language of instruction is a crucial foundation for children's learning and academic success** (e.g., Einarsdóttir et al., 2016; Golinkoff et al., 2019). Understanding the language of instruction is therefore essential when children learn to read and to write, as it shapes how effectively they acquire literacy and reading comprehension skills and how well they can access as well as understand instruction across the curriculum in other subjects (e.g., Giguere et al., 2024; Van Laere et al., 2014). A key component of this linguistic foundation is listening comprehension (in the language of instruction), which is the ability to understand spoken language. It draws on a range of cognitive and linguistic processes, such as vocabulary, grammar, inferencing, and prior linguistic knowledge (Babayigit & Shapiro, 2020; Hogan et al., 2014) and it predicts reading comprehension independently of other precursor skills such as word reading in the sense of decoding (i.e., linking sounds to letters; Hogan et al., 2014). Together listening comprehension and word decoding explain nearly all the variance in reading comprehension in early elementary school (De Jong & Van Der Leij, 2002; Lervåg et al., 2018).

Considering that the existing inequalities are assumed to result at least partially from the high language expectations of the Luxembourgish curriculum (LUCET & SCRIPT, 2023; Sattler, 2022) and in light of the (inter)national research findings showing that students are at a higher risk of struggling academically when the language(s) spoken at home differ from the language(s) of instruction in school (e.g., Hadjar et al., 2018; Kaufmann et al., 2025; Rogde et al., 2019; Röthlisberger et al., 2021), **the Luxembourgish government has implemented the literacy pilot project “ALPHA - zesumme wuessen”** in four primary schools. The pilot project broadens the language offer in schools following the Luxembourgish curriculum by **giving students at the beginning of primary education in C2.1 the possibility of learning to read and write in either French or German within mixed classes** (MENJE, 2022). In the context of the ongoing expansion of the national school offer (e.g., the pilot project ALPHA and the European Public Schools), **the Ministry of Education, Children and Youth has requested that these programmes should be considered within the existing school monitoring programme ÉpStan** to provide evidence-based information on the functioning of the school system as a whole (as defined in the 2023 Convention between the University of Luxembourg and the MENJE/SCRIPT).

Two reports have already been published on the pilot project on data collected in C2.1 (at the beginning of primary education) in the school years 2023/24 and 2024/25. The first encompassing

report on the pilot project was published in June 2024 and provides a detailed description of the four participating schools, the pedagogical concept and the implementation of the project before presenting preliminary ÉpStan results for grade C2.1 for the first full student cohort that started their primary education in the scope of "ALPHA - zesumme wuessen" in the school year 2023/24. The report included data from $N = 48$ ALPHA-French students who learn to read and write in French and $N = 65$ ALPHA-German students who learn to read and write in German with regard to their background characteristics (e.g., home languages), academic achievement and motivation, as well as their parents' perceived abilities to support them academically (Colling et al., 2024).

The ÉpStan results of the 2023/24 cohort assessed in C2.1 provided a first indication that the literacy pilot project "ALPHA - zesumme wuessen" could potentially contribute to reduce existing educational inequalities. For example, ALPHA-French students showed higher achievement and academic motivation in French—their language of literacy acquisition—compared to peers with similar background characteristics who were learning to read and write in German.

However, due to sample differences in terms of language background and SES (likely reflecting a more aligned orientation into the child's language of literacy acquisition group based on the child's home language background) as well as test adaptations to increase comparability across the different language versions, it is not possible to directly compare the first cohort (2023/24) with the second cohort assessed in C2.1 in 2024/25. Results for the second cohort showed comparable performance between ALPHA-French students and their reference group regarding academic achievement in the language of literacy acquisition (Colling et al., 2025).

Generally, it is important to note that the current scientific evaluation of the pilot project has important methodological and statistical limitations. The most significant of these relate to the small sample sizes even though the complete ALPHA cohorts participate. These aspects should therefore be taken into account when interpreting the results (see pp. 70-71 Colling et al, 2024 and pp. 25-26 Colling et al 2025; section 4.2 in this report).

In this report, the cross-sectional **data from the first cohort assessed in 2023/24 in C2.1 will be complemented by the ÉpStan data collected two years later, in the autumn of 2025/26, when the students were assessed in C3.1.** The aim of this report is thus, to empirically examine the **developmental trajectories** of this first cohort, who started their primary education in the scope of "ALPHA - zesumme wuessen" in 2023/24, between C2.1 and C3.1; a time period which can be considered crucial for the students' subsequent academic careers (e.g., regular pathways vs. grade retention).

2. THE LUXEMBOURG SCHOOL MONITORING PROGRAMME "ÉPREUVES STANDARDISÉES"

2.1 GENERAL DESCRIPTION

The "Épreuves Standardisées" (ÉpStan; Martin et al., 2015) refer to the well-established Luxembourgish School Monitoring Programme, which includes standardized achievement tests and questionnaires primarily designed to monitor the academic progress of primary and secondary school students in key learning domains such as mathematics, German, and French. These achievement tests are administered every autumn at the beginning of a new learning cycle in C2.1, C3.1 and C4.1 (primary education) as well as in 7^e and 5^e (lower secondary education) across all public and private state-subsidized schools. Their main purpose is to evaluate whether students have met the educational standards of the previous learning cycle as defined by the Ministry of Education, Children and Youth in the *Plan d'Études* (MENFP, 2011) of their respective grades.

The ÉpStan tests are carefully developed to ensure high quality and standardization. Test items are created by interdisciplinary teams, including researchers, active teachers from the respective cycles, and members from the Ministry. All items are rigorously pre-tested for content, format, and psychometric validity before being used in the actual ÉpStan achievement tests. The tests are concise, typically lasting between 30 to 50 minutes per grade and subject, and use closed formats like multiple-choice or short-answer questions to facilitate efficient and standardized assessment (Fischbach et al., 2014).

In addition to the monitoring of academic achievement, the ÉpStan entail student questionnaires to assess central features of students' academic motivation (e.g., academic self-concept) and wellbeing (e.g., class climate, teacher-student relationship). In addition, parent questionnaires at primary school level allow to collect data on the family's language background, their socio-economic status, and their perception of their possibilities to support their child academically. Students in primary school complete paper-and-pencil tests and questionnaires, while secondary school students complete tests and questionnaires on computers or tablets. This comprehensive approach allows for a systematic and ongoing evaluation of educational outcomes in Luxembourg.

Illustration 1 – Overview of the Luxembourgish School Monitoring Programme *Épreuves Standardisées* (ÉpStan) within the school system

	Educational stages								
	Preprimary		Primary				Lower secondary		
Learning Cycle	1		2		3		4		- - -
National designation of school year	C1.1	C1.2	C2.1	C2.2	C3.1	C3.2	C.4.1	C.4.2	7 ^e 6 ^e 5 ^e
School Monitoring Programme									 
First ALPHA cohort participation			23/24	→	25/26		27/28		29/30 31/32

2.2 MEASURES USED FOR EVALUATING THE LITERACY PILOT PROJECT IN C2.1 AND C3.1

2.2.1 ACADEMIC ACHIEVEMENT TESTS IN C2.1 (SCHOOL YEAR 2023/24)

In the 2023/24 school year, C2.1 student competences were assessed in mathematics, early literacy and listening comprehension in Luxembourgish as well as in the students' respective language of literacy acquisition. Each test included tasks aligned with the Luxembourgish Curriculum (MENFP, 2011) and categorized into two levels of theoretical difficulty: Level 1 (*Niveau Socle*) and Level 2 (*Niveau Avancé*).

An exception was made for the listening comprehension tests in the language of literacy acquisition, German and French, as these languages are not part of the Luxembourgish Curriculum for Cycle 1 (the previous learning cycle). In consequence, no *Niveau Socle* has been defined for German nor French at the end of Cycle 1. Comprehension of the language of literacy acquisition is, however, a crucial precursor skill for all subsequent academic learning, particularly in the domain of reading (Röthlisberger et al., 2021). To address this, German listening comprehension in C2.1 was added to the ÉpStan in 2022/23, and French listening comprehension was added in 2023/24 in C2.1 for children who learn to read and write in French in the scope of the literacy pilot project.

Like the other C2.1 tests, the German and French listening comprehension tests assessed two levels of theoretical difficulty. Items at difficulty level 1 assessed basic comprehension skills, such as understanding and completing short instructions (e.g., colour the shoes in blue), understanding familiar words (e.g., book, pencil), and comprehending short stories based on familiar topics (e.g., school, friends). Items at difficulty level 2 assessed more detailed comprehension of slightly longer texts and a broader vocabulary.

For a detailed description of the C2.1 tests, please refer to Colling et al. (2024, pp.25-29).

2.2.2 ACADEMIC ACHIEVEMENT TESTS IN C3.1 (SCHOOL YEAR 2025/26)

In the 2025/26 school year, students from the first cohort assessed in C2.1 in 2023/24 had advanced to C3.1 and were assessed in mathematics, as well as in listening and reading comprehension in their respective language of literacy acquisition (German or French) in C3.1. Each test included tasks aligned with the Luxembourgish Curriculum (MENFP, 2011), categorized into three levels of theoretical difficulty: Level 1 (*Niveau Sous-Socle*), Level 2 (*Niveau Socle*) and Level 3 (*Niveau Avancé*).

Illustration 2 - Overview of the test language per academic achievement test for the ALPHA-French and ALPHA-German group in Cycle 3.¹²

	Mathematics	Listening Comprehension	Reading Comprehension
Groups			
ALPHA-French			
ALPHA-German			

2.2.2.1 MATHEMATICS

The mathematics achievement test in C3.1 contained tasks assessing the following areas of competency: (a) *space and shapes*, (b) *numbers and operations*, and (c) *quantities and measures*. The tasks were presented in a decontextualised or in a contextualised way (MENFP, 2011). To minimize the influence of language, test instructions are short and simple or even given in an illustrated way. The mathematics achievement test consists of two mathematics booklets that students complete in their language of literacy acquisition (i.e., ALPHA-French students completed the tests in French whereas all the other students within the regular school system completed the tests in German). In total, the mathematics achievement test comprised 70 items: 12 items at *Level 1*, 29 items at *Level 2* and 29 items at *Level 3*. More information on the mathematics achievement test can be found on the ÉpStan website³, which also provides sample items⁴.

2.2.2.2 LISTENING COMPREHENSION IN GERMAN AND FRENCH

The tests evaluating either German or French listening comprehension primarily assess two sub-skills: identifying and applying information from a text, and construing information while activating listening strategies. The two test versions were direct translations of each other with the same amount of items, covering the same content through various text formats (e.g. dialogues, radio broadcasts or reports) on familiar topics such as animals, school, family and holidays. All texts and instructions are presented via audio files. In total, each listening comprehension test comprised 35 items presented in one test booklet: 13 items at *Level 1*, 13 items at *Level 2* and 9 items at *Level 3*. More information on the listening comprehension test can be found on the ÉpStan website⁵.

² At the national level, the test language used for the regular group, including the reference groups described in Section 2.3.1, was identical to the test language used for the ALPHA-German group.

³ <https://epstan.lu/en/assessed-competences-31/>

⁴ <https://epstan.lu/en/download-area-31/>

⁵ <https://epstan.lu/en/cycle-31-en/>

2.2.2.3 READING COMPREHENSION IN GERMAN AND FRENCH

The tests evaluating either German or French reading comprehension primarily assess two sub-skills: identifying and applying information from a text, and construing information while activating reading strategies and techniques. The two test versions were direct translations of each other with the same amount of items, covering the same content through various text formats including continuous (e.g. stories and simple factual texts) and discontinuous (e.g. recipes or craft instructions) texts, on familiar topics such as animals, school, family and holidays. The reading comprehension tests comprised 30 items presented in one test booklet: 8 items at *Level 1*, 16 items at *Level 2* and 6 items at *Level 3*. More information on the reading comprehension test can be found on the ÉpStan website⁶.

2.2.3 STUDENT QUESTIONNAIRE

The ÉpStan furthermore assess motivational aspects and student wellbeing with a self-report student questionnaire. In the C3.1 student questionnaire, various statements such as *"I am interested in most school subjects"* are presented to the students who are invited to express their level of agreement with each item on a four-point Likert scale using age-appropriate shaking heads as symbols for agreement or disagreement. Students completed the questionnaire in their language of literacy acquisition, i.e. students learning to read and write in French completed the questionnaire in French, whereas all the other students within the regular school system completed the questionnaire in German. The complete student questionnaire is available on the ÉpStan website⁷.

In C3.1, the three **motivational constructs of academic self-concept, interest and anxiety**, which have repeatedly been associated with students' academic achievement (e.g., Caviola et al., 2022; Jansen et al., 2016; Wu et al., 2021), and which are defined in more detail in Colling et al., 2024, are assessed in the student questionnaire. Each construct is measured at both a general and a domain-specific level for mathematics and the students' respective language of literacy acquisition (German/French). Whereas self-concept and interest are assessed with two general and two domain-specific items each (plus one item on the students' reading interest in their language of literacy acquisition), anxiety is assessed with one general item and one item per domain.

Besides these motivational variables, the ÉpStan student questionnaire targets four constructs (for definitions see Colling et al., 2024) measuring **student wellbeing**, which has also repeatedly been found to be related to academic achievement (e.g., Praetorius et al., 2018; Wollschläger et al., 2022). General school satisfaction and class climate are assessed by three items each, whereas teacher-student relationship and tendency for disruptions are measured by one item each.

⁶ <https://epstan.lu/en/cycle-31-en/>

⁷ <https://epstan.lu/en/cycle-31-en/>

The exact wording of all the items can be found under the respective figures in the present report (see section 3.3).

2.2.4 PARENT QUESTIONNAIRE

To gather information on the socioeconomical, sociocultural and linguistic background of each student that cannot be reliably assessed through the student questionnaire, the parents or legal representatives of primary school students are invited to respond to a parent questionnaire, which is presented in four languages (German, French, English and Portuguese).

Besides questions on the family's socioeconomic status (e.g., professional occupation of the parents, level of their qualifications) and sociocultural origins (e.g., country of birth), the questionnaire includes a section on parents' perceptions of multilingualism in Luxembourg's education system. This section assesses the parents' general perception of multilingualism (two items) as well as their perceptions of their own and the teachers' role in supporting their child academically (two items). In addition, five items are measuring to what extent the parents' own language skills allow them to support their child academically (e.g., communication with teachers, support in literacy acquisition, mathematics and homework). All these statements are presented to the parents on a 4-point Likert scale (ranging from "does not apply" to "does apply") and parents are invited to express their level of agreement with each item. The exact wording of the items is displayed under the respective figure in the present report (see section 3.4).

2.2.5 STUDENT BACKGROUND VARIABLES

Via the data from the student and parent questionnaires, the ÉpStan can take into account background variables (e.g., gender, socioeconomic, migration and home languages) that were proven to have an important impact on educational success in national and international studies (e.g., Agirdag & Vanlaar, 2016; Duong et al., 2016; Hornung et al., 2021; Sirin, 2005; Sonnleitner et al., 2021; Voyer & Voyer, 2014).

Regarding family socioeconomic status (**SES**), the *International Socio-Economic Index of Occupational Status* (ISEI, Ganzeboom, 2010; Ganzeboom et al., 1992) is used to classify a student's SES based on the professional occupation of the parents. The ISEI values range from 10 (e.g., kitchen helpers) to 89 (e.g., medical doctors). Within ÉpStan, the highest available ISEI value (HISEI) of either the father or the mother (or the child's legal representative) is considered. Looking at **migration background**, students are considered as natives when the students themselves and at least one of their parents were born in Luxembourg. To compare students based on their languages, students are considered to have a specific **language background** when they speak the respective language with at least one of their parents at home. With regard to **gender**, the student administrative database of the Ministry of Education, Children and Youth has been used.

2.3 METHODOLOGY USED FOR THE EVALUATION OF THE LITERACY PILOT PROJECT

As the present report follows the first cohort of students who started their primary education within the "ALPHA – zesumme wuessen" project in C2.1 in the 2023/24 school year and who were assessed again two years later in C3.1 in 2025/26, the analyses follow the exact same methodology as described in Colling et al. (2024) and will therefore only be outlined briefly in the following.

2.3.1 CREATION OF COMPARABLE STUDENT GROUPS VIA PROPENSITY SCORE MATCHING

The analysis of the 2023/24 student composition within the pilot project showed that the students from the four participating schools differ considerably from their peers at the national level when looking at student background characteristics (e.g., SES, migration, and language background; Colling et al., 2024). To nevertheless allow valid comparisons between different groups and to reduce bias, the statistical method of **propensity score matching** was used in order to compute reference groups from the national cohort, which include students whose individual background characteristics are comparable to those of the students taking part in the pilot project. Thereby, a total of five "statistical twins" with comparable background characteristics were identified for each student participating in the pilot project.

As the aim of this report is to empirically examine developmental trajectories, the findings presented in this report include only students that were assessed in both the ÉpStan 2023/24 in C2.1 and in the ÉpStan 2025/26 in C3.1 (i.e., the most recently collected data). The following five student groups are differentiated:

- (a) **ALPHA-French group** ($N = 37$ students from the four participating schools whose parents opted for literacy acquisition in French),
- (b) **ALPHA-French reference group** ($N = 172$ students, whose background characteristics are comparable to the ALPHA-French students and who were identified as "statistical twins" for the ALPHA-French students via the propensity score matching in C2.1),
- (c) **ALPHA-German group** ($N = 46$ students from the four participating schools whose parents opted for literacy acquisition in German),
- (d) **ALPHA-German reference group** ($N = 257$ students with background characteristics that are comparable to the ALPHA-German students and who were identified as "statistical twins" for the ALPHA-German students via the propensity score matching in C2.1), and
- (e) **Regular group at the national level** ($N = 4798$ students included as a reference sample to allow the results of students participating in the literacy pilot project to be interpreted within the broader national performance context).

Although comparable in their individual background characteristics, it has to be stressed that the students from the ALPHA-French reference group completed the ÉpStan achievement tests assessing listening and reading comprehension in German, whereas the ALPHA-French group completed both tests in French.

2.3.2 REPORTING OF THE ÉPSTAN ACHIEVEMENT RESULTS BY DIFFICULTY LEVEL

In order to provide meaningful insights into **educational trends** (e.g., longitudinal development of the student's academic achievement over time) and in line with well-established international large-scale assessments (e.g., PISA; OECD, 2018), the results of the ÉpStan achievement tests are generally reported by the means of one global score on the ÉpStan metric for each competence domain (e.g., mathematics), which is normed in such a way that the mean value for all students of a certain grade in Luxembourg lies at 500 points with a standard deviation of 100 points in a reference school year (usually the first year the respective competence was assessed in the respective grade; Fischbach et al., 2014).

A certain sample size is required in order to validly scale the results of an academic achievement test on this so-called ÉpStan metric using advanced Item Response Theory (IRT) models and DIF analyses. Although, this is possible for the students who completed the tests in German ($N = 4815$, thus including the ALPHA-German group), only $N = 37$ students (ALPHA-French group) of the students following the Luxembourgish curriculum completed the tests in French⁸ listening and reading comprehension. Therefore, it was not possible to scale these tests in the same way as the other ÉpStan achievement tests (e.g., German listening comprehension), which are taken by the full cohort of students ($N = 4798$) attending C3.1. Furthermore, it is not feasible to perform statistical hypothesis testing in order to explore group differences due to this small sample size. Results are thus reported as raw percentages. However, the reported analyses are conducted using full cohort data. As such the differences presented reflect the actual observed values across the entire cohort rather than estimates derived from a sample.

This report therefore presents the results for all achievement tests by their respective level of theoretical difficulty (i.e., level 1 corresponding to *Niveau Sous-Socle*, level 2 to *Niveau Socle*, and level 3 to *Niveau Avancé* as defined in the *plan d'études*; MENFP, 2011) rather than on the ÉpStan metric.

⁸ The French tests were also completed by the students enrolled in the French language section in the European Public schools. For more information, please consult the EPS reports (Colling et al., 2023, 2025).

2.3.3 COMPARABILITY OF RESULTS AND CONCEPTUAL EQUATING

In contrast to C2.1, where the students of all groups completed the same tests in mathematics and in Luxembourgish listening comprehension, thereby allowing a direct comparison between all groups, the tests in C3.1 all differed depending on the students' language of literacy acquisition (see *Figure 1*). The ALPHA-French students completed the ÉpStan achievement tests in mathematics as well as listening and reading comprehension tests in French, whereas all the other groups (including the ALPHA-French reference group) completed the mathematics test as well as the tests in listening and reading comprehension in German.

Thus, the achievement results of the ALPHA-French group in all C3.1 tests are **not directly comparable** to the results of the other four groups (b) to (e) as described in section 2.3.1. However, we implemented a **conceptual equating** between the two language versions of the tests. This means that all the tests were developed using the same reference documents (*i.e.*, *Plan d'Études*; MENFP, 2011) and that the two tests versions were translations containing the same amount of items and texts.

3. RESULTS

3.1 DEMOGRAPHIC INFORMATION ON THE LONGITUDINAL COHORT

The data analysis of the present chapter is based on the first student cohort that started their primary education in the scope of the “ALPHA - zesumme wuessen” pilot project in C2.1 in the school year 2023/24 and had also participated in the ÉpStan in C3.1 (2025/26). This longitudinal cohort thus only includes students, who were assessed at both ÉpStan time points, thereby excluding those with irregular educational pathways (e.g., grade retention, students that now attend private schools within Luxembourg that do not follow the Luxembourgish curriculum, to European Public Schools or moved to schools abroad).

Out of the $N = 48$ ALPHA-French students who had started C2.1 in 2023/24 (see Table A.3 in the Appendix), $N = 37$ students had participated in C3.1 (2025/26), representing 77 % of the original cohort. With regard to the ALPHA-French reference group, out of $N = 240$ students from C2.1 a total of $N = 172$ had participated in C3.1, which equals to 72 % and thus represents a slightly lower proportion of the original cohort than observed for ALPHA-French students. Based on information from the administrative data base of the MENJE (SCOLARIA), 17 % of ALPHA-French students experienced grade retention between C2.1 and C3.1 compared to 24 % of students in the ALPHA-French reference group. The remaining students did not participate in the EpStan 2025/26, because they now attend private schools within Luxembourg that do not follow the Luxembourgish curriculum, European Public Schools or moved to schools abroad.

From the $N = 65$ ALPHA-German students assessed in C2.1 in 2023/24, $N = 46$ students had participated in C3.1, accounting for 71 % of the original cohort. From the $N = 325$ students from the ALPHA-German reference group, a total of $N = 257$ students had participated in C3.1, representing 79 % of the original cohort and thus a slightly higher proportion than for the ALPHA-German group. In the ALPHA-German group, 20 % of students experienced grade retention compared to 18 % in the ALPHA-German reference group.

When looking at the regular group of students at the national level, $N = 4769$ students from originally $N = 5824$ students had participated in C3.1 (2025/26), accounting for 82 % of the original full ÉpStan cohort. At the national level, 14 % of students experienced grade retention between C2.1 and C3.1.

Table 1 offers an encompassing overview on the attrition and grade retention rates in the different groups.

Table 1 – Attrition and Grade Retention Rates the Longitudinal ÉpStan Cohort followed from 2023/24 to 2025/26

	N in 2023/24	N in 2025/26 (%)	N of students with grade retention (%)
“ALPHA - zesumme wuessen”			
ALPHA-French group	48	37 (77%)	8 (17%)
ALPHA-German group	65	46 (71%)	13 (20%)
ALPHA-French reference group	240	172 (72%)	57 (24%)
ALPHA-German reference group	325	257 (79%)	59 (18%)
National level	5824	4769 (82%)	809 (14%)

Note. N = Number of students. The % of students in 2025/26 and of students with a grade repetition does not sum up to 100 %, which is due to the fact that some students left the Luxembourgish school system.

Grade retention is thus the main reason explaining why students participated in the C2.1 ÉpStan 2023/24 but not in the C3.1 ÉpStan 2025/26. Previous studies on Luxembourg showed that the most vulnerable students to face grade retention are particularly those with a low SES (Hornung et al., 2021; Ottenbacher et al., 2024; Sonnleitner et al., 2021). As was observed in 2023/24 (for more details, see Colling et al., 2024), the cohort of ALPHA-French and ALPHA-German students, who started in C2.1, differed considerably from their peers at the national level with regard to their socio-economic status (SES; expressed as HISEI⁹ in Table 2), which resulted in the creation of statistical reference groups (see section 2.3.1 for details) with comparable background characteristics (e.g., mean HISEI of 42 in the ALPHA-French group compared to a mean HISEI of 43 in the ALPHA-French reference group). As indicated in Table 2 of the present report and compared to the C2.1 cohort in 2023/24, the C3.1 cohort of ALPHA-French students still shows a mean HISEI of 42, whereas the mean HISEI in the ALPHA-French reference group is a slightly higher with 46. This might be explained by the fact that more ALPHA-French students with a low SES advanced to C3.1 compared to the ALPHA-French reference group and experienced less grade retention. As indicated by the HISEI standard deviations (SD) in the table below and considering that the full HISEI scale ranges from 10 to 89, the difference of 4 HISEI points is however small.

Table 2 offers an encompassing overview on the sociodemographic characteristics of the five student groups presented in the subsequent results.

⁹ HISEI: Highest score in the *International Socio-Economic Index of Occupational Status* scale (ISEI, Ganzeboom, 2010; Ganzeboom et al., 1992). Within ÉpStan, the highest available ISEI value (HISEI) of either the father or the mother or the child's legal representative is considered as estimations for the socio-economic background of the students. Information on occupation is provided by the parents (see section 2.2.4).

Table 2 – Detailed Sample Description of the Longitudinal ÉpStan Cohort followed from 2023/24 to 2025/26

	Language background ¹⁰						
	N	HISEI (M/SD)	% female	% natives	% Lux/German	% French	% Portuguese
"Zesumme wuessen!"							
ALPHA-French group	37	42 (17)	51 %	14 %	16 %	27 %	43 %
ALPHA-German group	46	46 (17)	46 %	46 %	52 %	13 %	24 %
Regular curriculum							
ALPHA-French reference group	172	46 (18)	57 %	16 %	21 %	28 %	45 %
ALPHA-German reference group	257	45 (16)	46 %	45 %	47 %	10 %	21 %
National level	4769	53 (16)	49 %	44 %	46 %	21 %	19 %

Note. N = Number of students. HISEI = Highest international Socio-Economic Index of Occupational Status. In addition to the HISEI mean (M), the standard deviation (SD) is indicated in brackets. For details on the operationalisation of student background variables, see section 2.2.5.

Regarding the language background, the ALPHA-French group is characterised by a higher share of students speaking French (27 %) and/or Portuguese (43 %) with at least one of their parents (or legal representatives) at home, while ALPHA-German students predominantly speak Luxembourgish and/or German (52 %) at home. This can be considered an indication that the criteria-based orientation of students taking part in the pilot project seems to result in a closer match between their language of literacy acquisition and their home language(s).

National and international studies show that background characteristics such as gender (Boehm et al., 2016; Voyer & Voyer, 2014), SES (Brunner, 2006; Sirin, 2005), migration as well as language background (Agirdag & Vanlaar, 2016; Muller et al., 2014; OECD, 2016) are related to academic achievement. This underlines the importance of the creation of statistically computed reference groups via propensity score matching, whose individual background characteristics are similar to the ALPHA-French and the ALPHA-German group, thereby allowing more valid and fair statistical comparisons¹¹ (Kurz et al., 2024).

¹⁰ To avoid a ranking of different languages, one student can be found in more than one language group within the ÉpStan (e.g., students speaking Luxembourgish with their mother and Portuguese with their father are considered to have both a Luxembourgish and a Portuguese language background).

¹¹ On a descriptive level, the ALPHA-French and ALPHA-German group now differ slightly more from their respective statistical reference groups in terms of background characteristics (see Table 2) than at the time of initial matching in Grade 1, two years earlier, likely due to differential attrition (e.g., higher grade retention rates in the ALPHA-French reference group). To test the robustness of the findings, an alternative reference group was constructed for ALPHA-French and ALPHA-German students who participated in the ÉpStan in Grade 3, using the same matching principles (see 2.3.1). Although this resulted in small changes in the percentage of correctly answered items across competency domains for this alternative reference groups (e.g. from – 3 to + 1 for the ALPHA-French reference group), the overall pattern of results remained unchanged with no differences exceeding 10 % between the groups. This supports the robustness of the initial propensity matching approach and the reported findings. Please find the detailed analyses as well as further explanations in the Appendix.

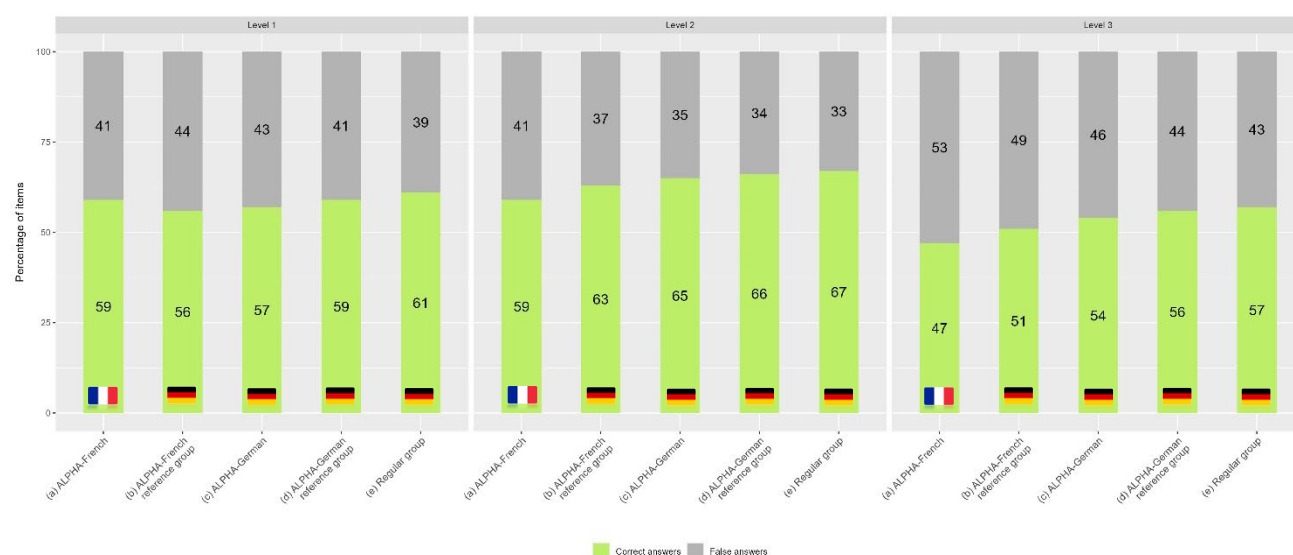
3.2 ACADEMIC ACHIEVEMENT

Considering that academic achievement is one of the most central outcome variables and that both national and international studies have repeatedly found significant differences in key domains (e.g., mathematics, reading and listening comprehension) between student groups (e.g., Boehm et al., 2016; Hornung et al., 2021, Kaufmann et al., 2025), the present chapter shows results how the C3.1 students of the pilot project (ALPHA-French and ALPHA-German groups) perform in mathematics, and in their respective language of literacy acquisition (listening and reading comprehension) in comparison to their statistical reference groups and their peers at the national level.

3.2.1 MATHEMATICS

In the ALPHA-pilot project, students learn mathematics in their respective language of literacy acquisition, either in separate or mixed group settings. The mathematics test in C3.1 was therefore completed in French by the ALPHA-French students and in German by the students of all the other groups. Figure 1 depicts the results in mathematics split by the three levels of theoretical difficulty. In line with the national education standards (*Plan d'Études*), difficulty level 1 refers to the *Niveau Sous-Socle*, level 2 to *Niveau Socle* and level 3 to *Niveau Avancé*. The green bars indicate the percentage of items answered correctly, whereas the grey bars indicate the percentage of items for which the students gave false or no answers. The flag in each bar indicates the language in which the test was completed.

Figure 1 - Academic Achievement in Mathematics by Level of Theoretical Difficulty in C3.1



Note. 12 items are at Level 1 (a 10% difference corresponds to 1.2 additional correct answer on average); 29 items are at Level 2 and 29 items are at level 3 (a 10% difference corresponds to 2.9 additional correct answers on average).

Looking at difficulty level 1 (displayed in the left panel of *Figure 1*), the amount of correctly answered items ranged from 56 % in the ALPHA-French reference group to 61 % at the national level. For level 2 items (displayed in the middle panel of *Figure 1*), the percentage of correctly answered items ranged from 59 % in the ALPHA-French group to 67 % for students at the national level). Looking at the more difficult items at level 3 (displayed in the right panel of *Figure 1*), the amount of correctly answered items was slightly lower across all groups ranging from 47 % in the ALPHA-French group to 57 % for students at the national level. Thus, no considerable group differences going beyond the 10 % level could thus be identified in mathematics across the five groups.

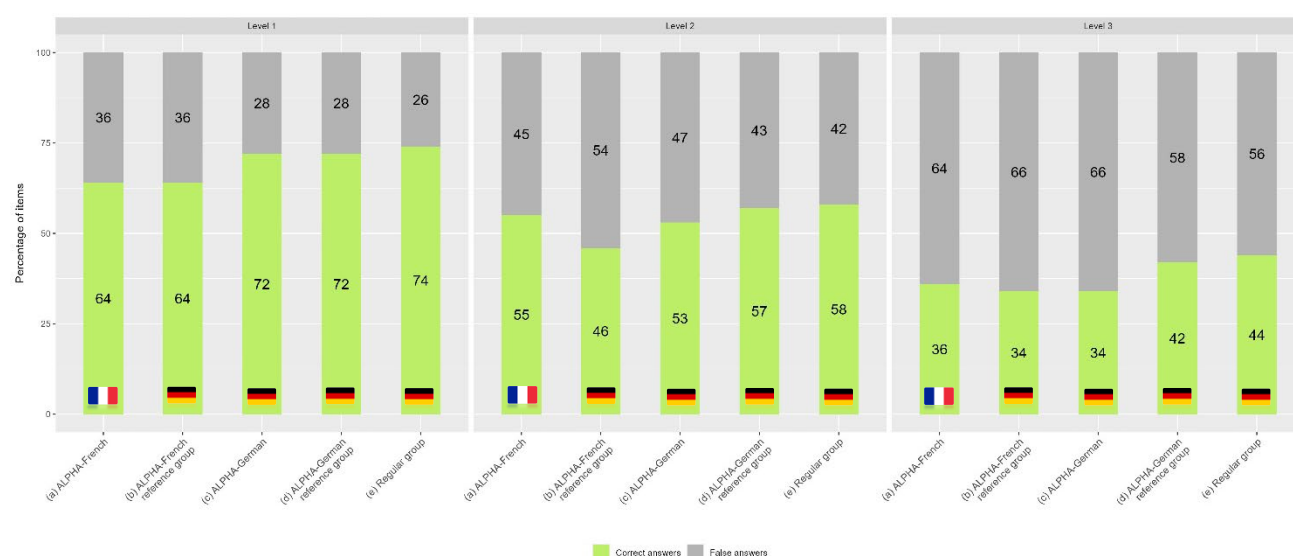
3.2.2 LISTENING COMPREHENSION IN THE LANGUAGE OF LITERACY ACQUISITION

In C3.1, listening comprehension in the students' language of literacy acquisition was assessed. ALPHA-French students thus completed the listening comprehension test in French, whereas students from all other groups (including the ALPHA-French reference group) completed this test in German (see section 2.2.2).

Figure 2 shows the students' results in listening comprehension split by levels of theoretical difficulty. The green bars indicate the percentage of items answered correctly, whereas the grey bars indicate the percentage of items for which the students gave false or no answers. The flag in each bar indicates the language in which the test was completed.

Looking at difficulty level 1 (displayed in the left panel of *Figure 2*), the amount of correctly answered items ranged from 64 % in the ALPHA-French and ALPHA-French reference group to 74 % for students at the national level. For level 2 items (displayed in the middle panel of *Figure 2*), the percentage of correctly answered items ranged from 46 % in the ALPHA-French reference group to 58 % for students at the national level. Looking at the more difficult items at level 3 (displayed in the right panel of *Figure 2*), the amount of correctly answered items was lower across all groups ranging from 34 % in the ALPHA-German and the ALPHA-German reference group to 44 % in students at the national level. No systematic group differences beyond 10 % (with the only exception of the ALPHA-French reference group at level 2 compared to the ALPHA-German reference group and the regular students at national level) can be observed. These findings do not seem to indicate considerable group differences in listening comprehension, irrespective of the language of literacy acquisition.

Figure 2 - Academic Achievement in Listening Comprehension by Level of Theoretical Difficulty in C3.1



Note. 13 items are at Level 1 and Level 2 (a 10% difference corresponds to 1.3 additional correct answer on average), and 9 items are at level 3 (a 10% difference corresponds to 0.9 additional correct answer on average).

3.2.3 READING COMPREHENSION IN THE LANGUAGE OF LITERACY ACQUISITION

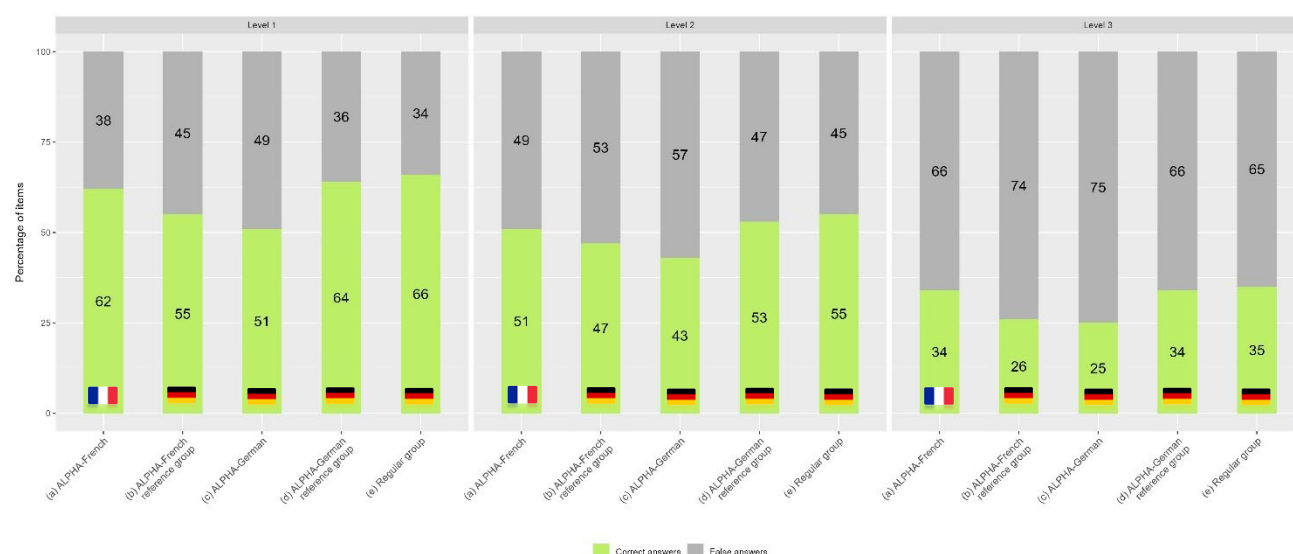
The ÉpStan in C3.1 assessed reading comprehension in the students' language of literacy acquisition with ALPHA-French students completing the reading comprehension test in French and students from all other four groups (including the ALPHA-French reference group) completed the test in German (see section 2.2.2).

Figure 3 shows the students' results in reading comprehension split by levels of theoretical difficulty. The green bars indicate the percentage of items answered correctly, whereas the grey bars indicate the percentage of items for which the students gave false or no answers. The flag in each bar indicates the language in which the test was completed.

Looking at difficulty level 1 (displayed in the left panel of Figure 3), the amount of correctly answered items ranged from 51 % in the ALPHA-German group to 66 % for students at the national level. For level 2 items (displayed in the middle panel of Figure 3), the percentage of correctly answered items ranged from 43 % in the ALPHA-German group to 55 % for students at the national level. Looking at the more difficult items at level 3 (displayed in the right panel of Figure 3), the amount of correctly answered items was lower across all groups ranging from 25 % in the ALPHA-German group to 35 % in students at the national level. Students from the ALPHA-German group performed considerably below their peers in the ALPHA-German reference group, in the ALPHA-French group and at the national level for level 1 items as well as for level 2 items when compared to regular students at the national level. No other systematic group differences beyond 10 % were observed, suggesting that student

groups have achieved comparable levels in reading comprehension, regardless of their language of literacy acquisition¹².

Figure 3 - Academic Achievement in Reading Comprehension by Level of Theoretical Difficulty in C3.1



Note. 8 items are at Level 1 (a 10% difference corresponds to 0.8 additional correct answers on average), 16 items are at Level 2 (a 10% difference corresponds to 1.6 additional correct answers on average), and 6 items are at level 3 (a 10% difference corresponds to 0.6 additional correct answer on average).

3.3 ACADEMIC MOTIVATION AND STUDENT WELLBEING (STUDENT QUESTIONNAIRE)

As described in detail in section 2.2.3, the ÉpStan student questionnaire is assessing motivational aspects (i.e., academic self-concept, interest, and anxiety) at the general (i.e., across school subjects) and at a domain-specific level (i.e., related to mathematics and to the language of literacy acquisition).

Students express their level of (dis-)agreement on a four-point Likert scale using age-appropriate shaking heads as symbols for either agreement (yes) or disagreement (no) with various statements (e.g., “I am interested in most school subjects”). The student questionnaire is presented to the students in their respective language of literacy acquisition (German/French), and teachers can refer to standardised translations of all items in Luxembourgish to support the students during the completion of the questionnaire.

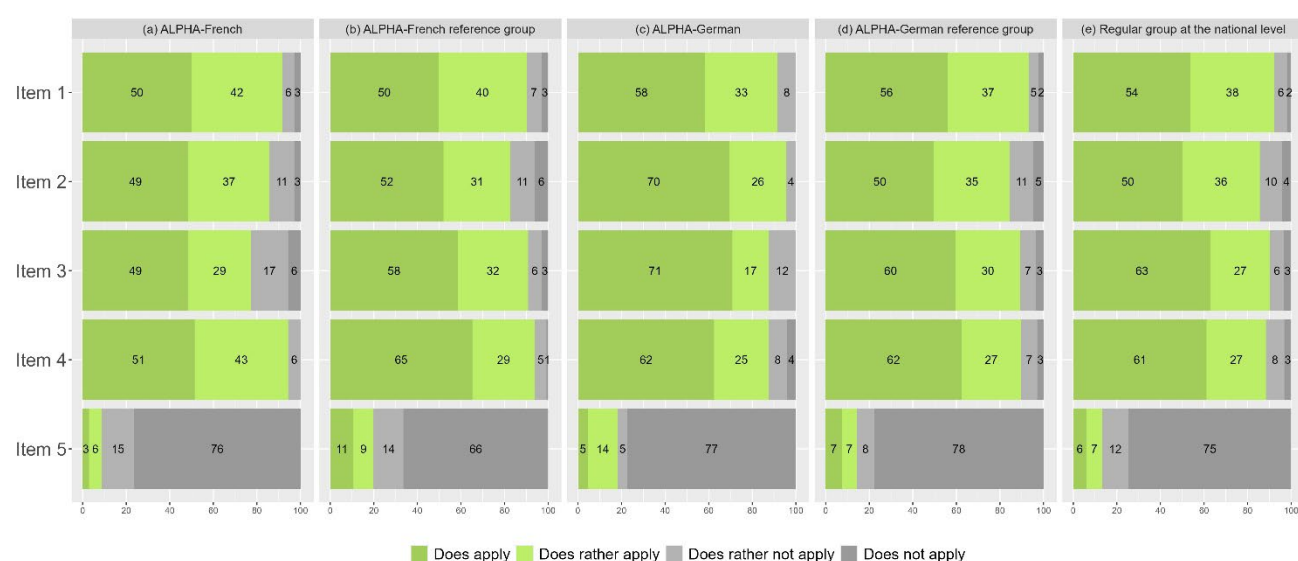
¹² ÉpStan assessments are intended for system-level monitoring and therefore do not exclude students based on individual test performances. However, small sample sizes as in the present report may be more sensitive to statistical outliers (e.g., students with exceptionally high or low results). Therefore, all tests were screened for outliers. The ÉpStan test in reading comprehension was the only one for which we observed extreme statistical outliers (i.e., students who answered 0 % of items correctly across all levels). This concerned two ALPHA-French students, one student in the ALPHA-French reference group, and 11 students at the national level. For this test, extreme cases were excluded and the impact on the results was examined. This resulted in increases of + 4 % at level 1, + 3 % at level 2, and +2 % at level 3 for the ALPHA-French students and of +1 % at level 3 for the students of the ALPHA-French reference group. As no systematically different pattern emerged, these findings indicate the robustness of the results despite the small sample size.

3.3.1 DOMAIN-GENERAL ACADEMIC MOTIVATION

Figure 4 shows the results for the C3.1 students' general academic motivation. The exact wording of all items is provided in the table below the figure. Items 1 and 2 measure **general academic self-concept**. As expressed by the dark and light green bars, the vast majority of C3.1 students have a high general academic self-concept. When looking at item 1 (*"I am good at most school subjects"*), for example, agreement rates are ranging from 90 % in the ALPHA-French reference group to 93 % in the ALPHA-German reference group. Items 3 and 4 assess general academic interest. Results of item 3 (*"I enjoy most school subjects"*) indicate that most C3.1 students have a high general academic interest with agreement rates ranging from 78 % in the ALPHA-French group to 90 % in the ALPHA-French reference group, the ALPHA-German reference group and students at the national level). As indicated by the dark and light grey bars for item 5 (*"I am afraid of most school subjects"*) assessing general academic anxiety, the vast majority of C3.1 students indicates that they do not perceive feelings of general academic anxiety.

General academic motivation is thus very high across all items; an observation that can be made irrespective of the students' language of literacy acquisition. Although small differences can be observed between student groups for single items (e.g., a lower share of ALPHA-French students fully agreeing with item 4 compared to the other four groups as indicated by the dark green bars; a higher share of ALPHA-German students fully agreeing with item 2 compared to all other groups as indicated by the dark green bars), no systematic group differences across items and constructs could be identified.

Figure 4 – General Academic Motivation in C3.1 Expressed in Percentages



Item 1	I am good at most school subjects.
Item 2	I learn things quickly in most school subjects.
Item 3	I enjoy most school subjects.
Item 4	I am interested in most school subjects.
Item 5	I am afraid of most school subjects.

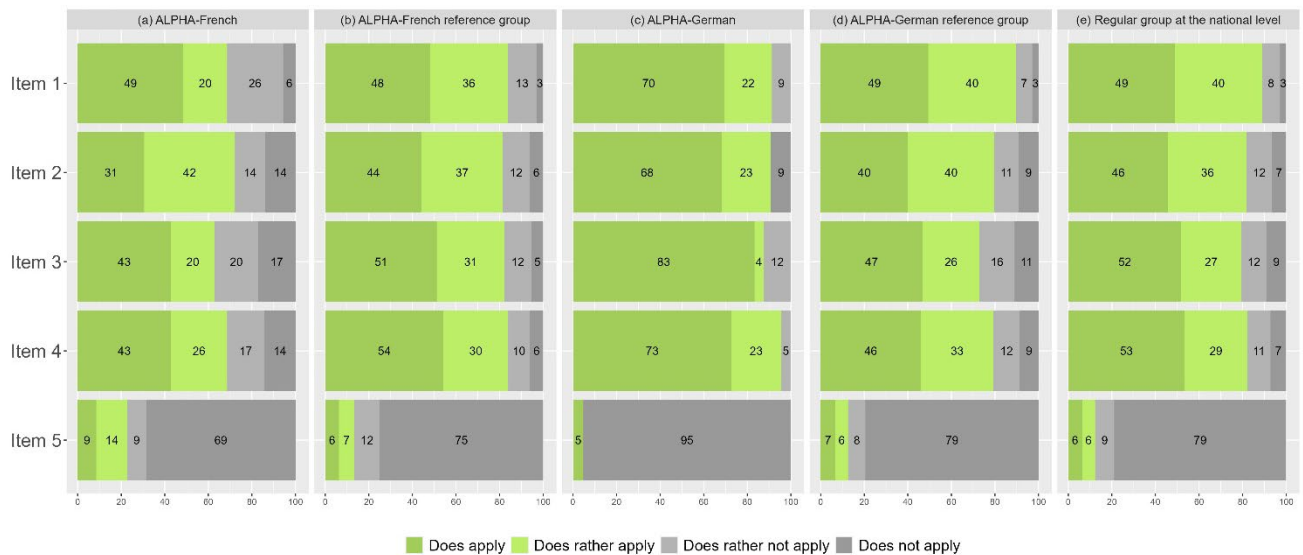
3.3.2 DOMAIN-SPECIFIC ACADEMIC MOTIVATION

3.3.2.1 ACADEMIC MOTIVATION IN MATHEMATICS

Figure 5 illustrates the results for C3.1 students' domain-specific academic motivation in mathematics. The first two items assessed academic self-concept in mathematics. Although lower than their domain-general academic self-concept, the vast majority of C3.1 students have a high domain-specific **self-concept** in mathematics with the percentage of students (rather) agreeing with, for example, item 2 ("I learn things quickly in maths") ranging from 73 % in ALPHA-French students to 91 % in ALPHA-German students as indicated by the dark and light green bars. Items 3 and 4 assessed the students' academic **interest** in mathematics and results indicate that most C3.1 students enjoy mathematics with agreement rates ranging from 63 % in the ALPHA-French group to 87 % in the ALPHA-German group for the example of item 3 ("I enjoy maths"). Math **anxiety**, which is assessed by item 5 ("I am afraid of maths"), furthermore illustrates that C3.1 students generally do not perceive feelings of mathematics anxiety ranging from 78 % in ALPHA-French students to 95 % in ALPHA-German students as indicated by the dark and light grey bars. It can thus be concluded that the academic motivation in mathematics is high across all items; an observation that can be made irrespective of the students' language of literacy acquisition. Looking at differences between student groups, it does, however, become apparent that ALPHA-German students expressed a higher academic motivation in mathematics compared to all other groups and across all items (e.g., 83 % of ALPHA-German students fully agreeing with the statement "I enjoy maths" compared to 43 % in the ALPHA-French group for example as indicated by the dark green bars). On the other hand, the share of ALPHA-French

students, who learn mathematics in French, that fully or rather agree with the statements “*I am good at maths*” as well as with “*I enjoy maths*” (as indicated by the dark and light green bars) is lower compared to the students from the ALPHA-French reference group, learning mathematics in German.

Figure 5 – Domain-Specific Academic Motivation in Mathematics in C3.1 Expressed in Percentages

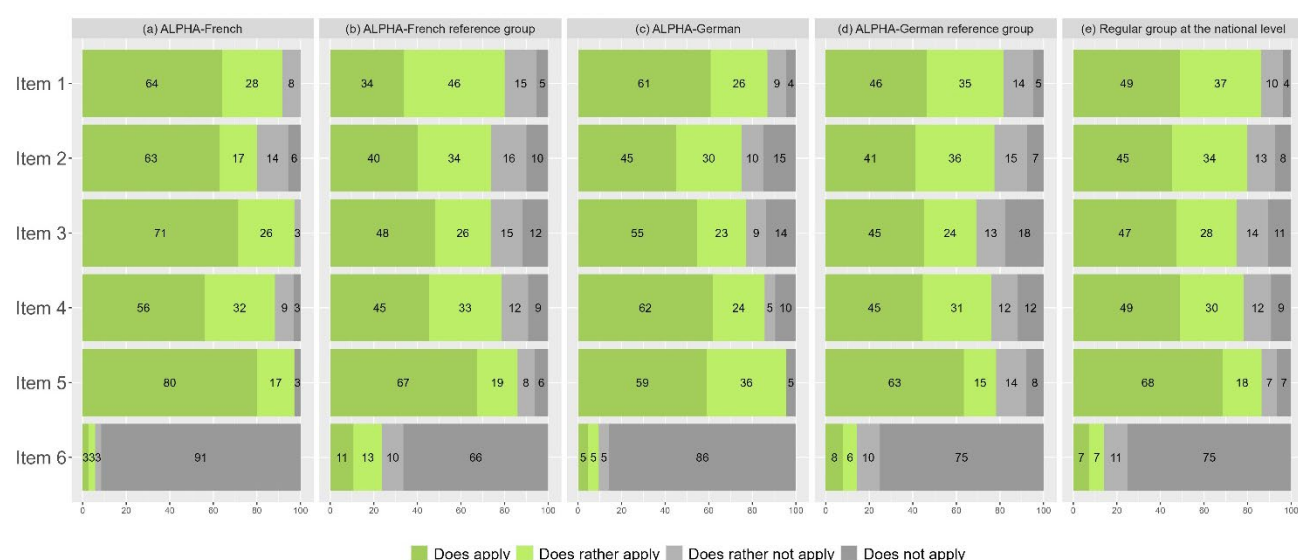


Item 1	I am good at maths.
Item 2	I learn things quickly in maths.
Item 3	I enjoy maths.
Item 4	I am interested in maths.
Item 5	I am afraid of maths.

3.3.2.2 ACADEMIC MOTIVATION IN THE LANGUAGE OF LITERACY ACQUISITION

Regarding domain-specific academic motivation in the students' language of literacy acquisition, the items were presented to the students in the ALPHA-French group referring to French (e.g., "*I am good in French*"), whereas all the other groups responded to the items referring to German (e.g., "*I am good in German*"). Figure 6 shows the results for domain-specific academic motivation in the language of literacy acquisition. As indicated by the dark and light green bars, the vast majority of C3.1 students have a high domain-specific **self-concept** in their language of literacy acquisition (assessed by items 1 and 2) with the percentage of students (rather) agreeing with item 1 ("*I am good in my language of literacy acquisition*"), for example, ranging from 80 % in the ALPHA-French reference group to 92 % in the ALPHA-French group. For items 3 and 4, assessing the students' **interest** in their language of literacy acquisition, it can be observed that most C3.1 students enjoy their language of literacy acquisition with agreement rates ranging, for example, from 69 % in the ALPHA-German reference group to 97 % in the ALPHA-French group for item 3 ("*I enjoy my language of literacy acquisition*"). For item 5, assessing the students' **enjoyment to read** in their language of literacy acquisition, C3.1 students expressed a high enjoyment with agreement rates ranging from 78 % in the ALPHA-German reference group to 97 % in the ALPHA-French group. As indicated by the grey bars for item 6 ("*I am afraid of my language of literacy acquisition*"), the vast majority of C3.1 students indicates that they do not perceive feelings of **anxiety** related to their language of literacy acquisition ranging from 76 % in the ALPHA-French reference group to 94 % in the ALPHA-French group as indicated by the dark and light grey bars. Domain-specific academic motivation in the students' language of literacy acquisition is high across all items, but in contrast to general and domain-specific academic motivation in mathematics, ALPHA-French students systematically express a higher domain-academic self-concept and interest (as expressed by their full agreement indicated in the dark green bars) as well as a lower anxiety (as expressed by their full disagreement indicated in the dark grey bars) compared to the other student groups with differences being particularly pronounced compared to the ALPHA-French reference group.

Figure 6 - Domain-Specific Academic Motivation in the Language of Literacy Acquisition in C3.1 Expressed in Percentages



Item 1	I am good in my main language of instruction.
Item 2	I learn things quickly in my main language of instruction.
Item 3	I enjoy my main language of instruction.
Item 4	I am interested in my main language of instruction.
Item 5	I like to read in my main language of instruction.
Item 6	I am afraid of my main language of instruction.

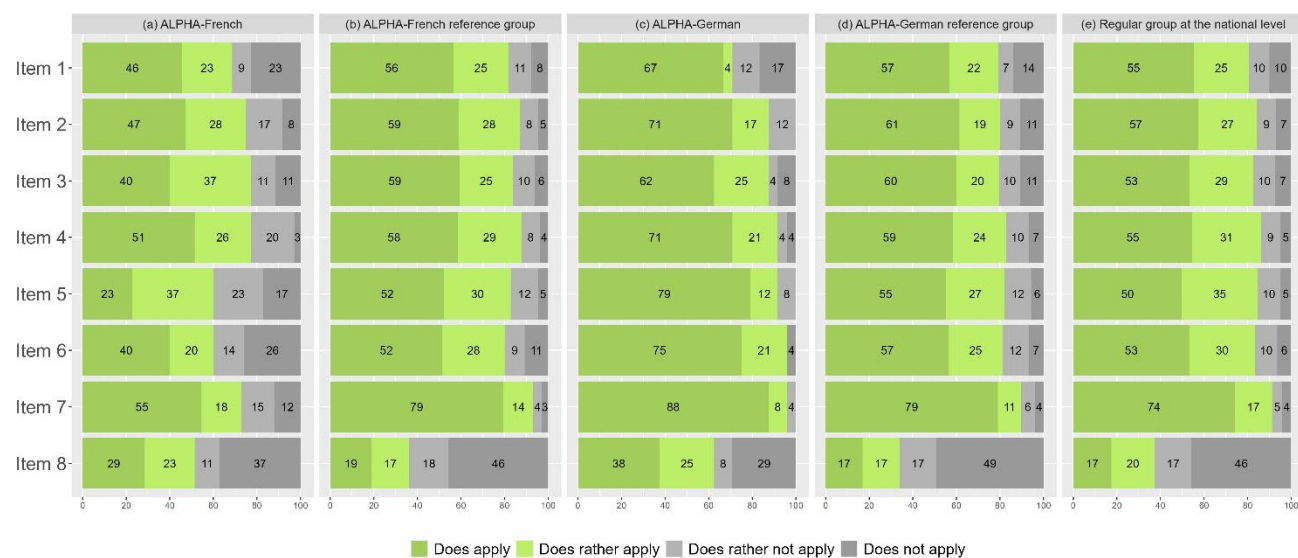
Note. For visualisation purposes, the questionnaire items were rephrased for the present figure in such a way that all the items apply to the five student groups, whereas the phrasing in the original questionnaire presented to the students was in line with their respective language of literacy acquisition (i.e., "I am good in French" for the ALPHA-French group versus "I am good in German" for the other four groups).

3.3.3 STUDENT WELLBEING

Figure 7 illustrates the results for C3.1 students' academic wellbeing with the first three items assessing **general school satisfaction**. As indicated by the dark and light green bars, the majority of C3.1 students perceive a high school satisfaction with agreement rates ranging from 69 % in the ALPHA-French group to 81 % in the ALPHA-French reference group for item 1 ("I like going to school"), for example. Items 4, 5 and 6 assessed **class climate** and results indicate that most C3.1 students experience a positive class climate with agreement rates for item 6 ("In my class, we all stick together"), for example, ranging from 60 % in the ALPHA-French group to 96 % in the ALPHA-German group. Looking at item 7 ("In my class, we get extra support from my teacher when we need it") assessing **teacher-student relationship**, the agreement rates ranging from 73 % in ALPHA-French students to 96 % in ALPHA-German students show that the majority of C3.1 students experience a positive teacher-student relationship. For item 8 ("In my class, we sometimes disrupt the class on purpose") assessing the students' tendency for purposeful interruptions, most C3.1 students indicate a moderate **tendency for purposeful disruptions** with agreement rates ranging from 34 % in the ALPHA-German reference group to 63 % in the ALPHA-German group. The majority of C3.1 students experience a rather high general school satisfaction, as well as a positive class climate and teacher-student relationship. With regard to systematic group

differences, it does, however, become apparent, that students in the ALPHA-French group expressed a considerably lower academic wellbeing (as can be seen by the share of students fully agreeing with the different items) compared to the other groups across all items, whereas students from the ALPHA-German group reported a higher academic wellbeing than their peers in all the other student groups.

Figure 7 - Academic Wellbeing in C3.1 Expressed in Percentages



Item 1	I like going to school.
Item 2	School is fun.
Item 3	I am happy when I am at school.
Item 4	In my class, we help each other.
Item 5	In my class, we get along well.
Item 6	In my class, we all stick together.
Item 7	In my class, we get extra support from my teacher if we need it.
Item 8	In my class, we sometimes disrupt the class on purpose.

3.4 PERCEPTIONS OF PARENTAL SUPPORT (PARENT QUESTIONNAIRE)

In addition to students' academic achievement and motivation, the parents' perceived capacities to support their child when it comes to learning (e.g., doing homework, preparing for tests) have been identified to be positively related to academic achievement (Bakker et al., 2007; Boonk et al., 2018), and depend at least partially on the parents' language abilities in their child's language(s) of instruction.

Figure 8 illustrates the results on perceived parental support capacities of parents who have a child attending C3.1. As indicated by the dark and light green bars, the vast majority of parents from all five groups (rather) agree that the **multilingualism of the schools in Luxembourg offers their child good future opportunities**, ranging from 97 % (ALPHA-French reference group, ALPHA-German reference group, and students at the national level) to 100 % (ALPHA-French and ALPHA-German groups; see item 1). Despite this positive perception of multilingualism as such, approximately one third of all the

parents did (rather) agree that the **multilingualism in Luxembourg's schools poses a difficulty to their child** with agreement rates ranging from 26 % (ALPHA-French group) to 40 % (ALPHA-French reference group; see item 2).

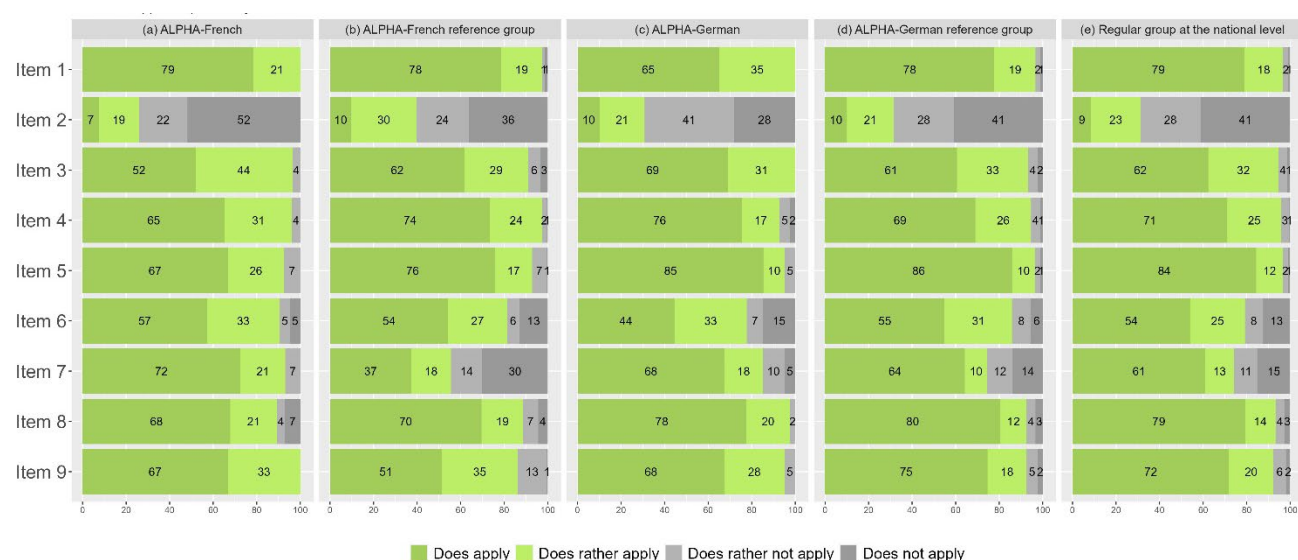
Regarding the perceived responsibility for **supporting children's school learning**, parents of all five groups (rather) agree that teachers (ranging from 91 % in the ALPHA-French reference group to 100 % in the ALPHA-German group; see item 3) and themselves as parents or legal guardians (ranging from 93 % in the ALPHA-German group to 98 % in the ALPHA-French reference group; see item 4) are equally responsible to support the children in their school learning.

With regard to **communication with their child's teacher** (e.g., during the *Bilan* talks or at parents' evenings), the vast majority of parents across all groups (rather) perceive that their own language skills allow them to communicate effectively (ranging from 93 % in the ALPHA-French group and in the ALPHA-French reference group to 96 % in the ALPHA-German reference group and for parents at the national level; see item 5). Additionally, most parents **can rely on help from the school and/or school external help** when having difficulties in exchanging with their child's teacher (ranging from 77 % in the ALPHA-german group to 90 % in the ALPHA-French group, see item 6).

The last three items are specifically interesting to understand how the **parents' own language skills** in their child's language of literacy acquisition allow them to support their child academically (e.g., in learning in their language of literacy acquisition, in mathematics and during their homework).

Whereas 93 % of parents in the ALPHA-French group have the **perception that they are (rather) able to support their child's learning in their language of literacy acquisition** (i.e., French), this proportion is considerably lower in the ALPHA-French reference group, where only 55% perceive themselves as (rather) able to provide such support in German, due to their own skills in their child's language of literacy acquisition (see item 7). With regard to parents' **perceived capacity to support their child when learning mathematics and when doing their homework**, the vast majority of parents of all groups reported a (rather) high ability to support their child with agreement rates ranging from 89 % in the ALPHA-French group and in the ALPHA-French reference group to 98 % in the ALPHA-German group (see item 8) and from 86 % in the ALPHA-French reference group to 100 % in the ALPHA French group (item 9).

Figure 8 - Parental Support in C3.1 Expressed in Percentages



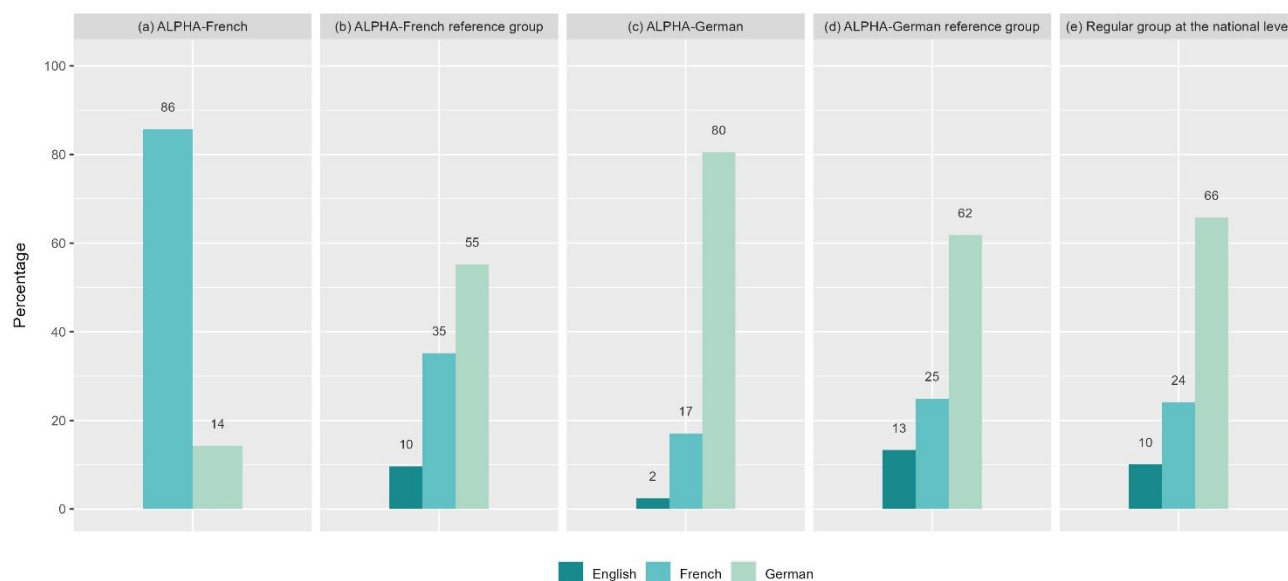
Item 1	The multilingualism of the schools in Luxembourg offers our child good future opportunities.
Item 2	The multilingualism of the schools in Luxembourg poses a difficulty to our child.
Item 3	It is the task of the teacher to support our child in their school learning.
Item 4	It is our task as parents/legal guardians to support our child in their school learning.
Item 5	Our language skills allow us to have an exchange with our child's teacher (e.g., <i>Bilan</i> talks, parents' evening).
Item 6	If there are difficulties in exchanging with our child's teacher, we can rely on help from the school and/or on school external help.
Item 7	Our language skills in our child's main language of instruction allow us to support our child in learning in German OR French.
Item 8	Our language skills in our child's main language of instruction allow us to support our child in the subject of mathematics.
Item 9	Our language skills in our child's main language of instruction allow us to support our child with their homework.

3.5 PARENTS' PREFERRED LANGUAGE OF LITERACY ACQUISITION

In the parent questionnaire, parents were furthermore asked which language of literacy acquisition they would retrospectively have preferred for their child in C2.1 with German, French and English as answer options, considering that those are the three languages in which literacy acquisition is currently offered in the national school system (i.e., for a small number of students in the scope of the pilot project and for the general population in the six European Public Schools of the country).

Figure 9 depicts the findings for the parents' **preferred language of literacy acquisition** for their child. The strongest overlap between the child's actual language of literacy acquisition and the parents' preferred language of literacy acquisition can be observed in both the ALPHA-French (86 %) and the ALPHA-German group (80 %). In the other three groups, the majority of parents of C3.1 students indicated German to be their preferred language of literacy acquisition (ranging from 55 % in the ALPHA-French reference group to 66 % for students at national level). It is however noteworthy that approximately one third of parents in the ALPHA-French reference group would have preferred French (35 %) as language of literacy acquisition, followed by English (10 %). Although slightly less pronounced, the same pattern can also be observed for the ALPHA-German reference group and at the national level where approximately 25 % would have opted for French if given the choice.

Figure 9 – Preferred Language of Literacy Acquisition Expressed in Percentages



4. CONCLUSION

4.1 OBJECTIVE OF THE PROJECT

There is growing scientific evidence that children have better learning opportunities if they learn to read and write in a language that corresponds to or is linguistically closer to their home language background (e.g., Jaekel et al., 2023; Rogde et al., 2019; Röthlisberger et al., 2021) because vocabulary and syntax are more similar (see Section 1 for more details). According to Schepens et al. (2016) the facilitation hypothesis suggests that a first language supports the acquisition of a second language, when the two languages are linguistically closer. By contrast, if the linguistic distance between the home language and the language of literacy acquisition is larger, acquiring the language of literacy acquisition, which is then considered as a second language, can be impeded.

In particular, the lexical similarity between words in different languages, labeled cognate linguistic distance, appears to be a key predictor of second language achievement (Van Der Slik, 2010). For instance, Muñoz et al. (2018) show that the linguistic similarity between Danish and English facilitates the acquisition of receptive grammar skills in English. Indeed, Danish-speaking children reach better English receptive skills than their Spanish-speaking peers, due to the higher linguistic similarity between Danish and English than between Spanish and English.

For Luxembourg, data from the ÉpStan consistently show that children who do not speak Luxembourgish or German at home perform weaker in Luxembourgish listening comprehension, German reading and listening comprehension, as well as in mathematics and that these achievement gaps become apparent already in early primary school (e.g., Hornung et al., 2021, 2023; Kaufmann et al., 2025; Ottenbacher et al., 2024) and are particularly pronounced among children from socio-

economically disadvantaged families. One explanation for these early achievement gaps is that the current approach to literacy instruction in German might not adequately meet the needs of Luxembourg's highly linguistically diverse student population. Based on the facilitation hypothesis, it could be argued that children who speak French or Portuguese at home would have better opportunities for literacy acquisition in French which is linguistically closer to their home language compared to German, which is currently the language of literacy acquisition in schools following the Luxembourgish curriculum.

The pilot project "ALPHA – zesumme wuessen" was launched with the aim of promoting educational equity at the start of primary school and specifically counteracting existing educational inequalities. The objective of the project is to allow children to learn to read and write in a language that is linguistically closer to their respective home languages.

With the ÉpStan data collected in the autumn of 2025/26, the academic achievement and motivation of the first cohort - who started their primary education within the framework of "ALPHA - zesumme wuessen" in 2023/24, and was assessed in C2.1 - has been empirically examined in C3.1; a time which is crucial for the students' subsequent academic careers (e.g., regular pathways vs. grade retention). The main findings will be summarized in the following.

4.2 SUMMARY OF THE REPORT'S MAIN FINDINGS

In C3.1, the ÉpStan assessed **academic achievement** in mathematics as well as in listening and reading comprehension in the students' respective language of literacy acquisition (i.e., German and French). No considerable achievement differences were identified between the ALPHA-French group, the ALPHA-French reference group, the ALPHA-German group, the ALPHA-German reference group, and students at the national level in mathematics (see *Figure 1*) nor in listening (see *Figure 2*) and reading comprehension (see *Figure 3*) in the respective language of literacy acquisition at the beginning of Cycle 3. Across all levels of theoretical difficulty tested, the groups achieved comparable results, regardless of whether the achievement tests were completed in German or French.

Regarding **general and domain-specific academic motivation**, a majority of students from all five groups expressed a strong general academic motivation (see *Figure 4*) as well as a high domain-specific academic motivation in mathematics (see *Figure 5*) at the beginning of Cycle 3. Looking at differences between student groups, it does, however, become apparent that ALPHA-German students expressed a higher motivation in mathematics compared to all other groups and across all items. Domain-specific academic motivation in the students' language of literacy acquisition was high across all items (see *Figure 6*), but in contrast to general and domain-specific motivation in mathematics, ALPHA-French students generally expressed a higher domain-specific academic self-

concept and interest as well as a lower anxiety compared to the other student groups with differences being particularly pronounced compared to the ALPHA-French reference group.

Looking at **academic wellbeing**, the majority of C3.1 students experienced a rather high general school satisfaction, as well as a positive class climate and teacher-student relationship (see *Figure 7*). With regard to systematic group differences, students in the ALPHA-French group expressed a considerably lower academic wellbeing in terms of class climate and teacher-student relationship (as can be seen by the share of students fully agreeing with the different items) compared to the other groups, whereas students from the ALPHA-German group reported a higher academic wellbeing than their peers in all the other student groups.

For **parental support**, despite a generally positive perception of multilingualism as such, approximately one third of all the parents (rather) agreed that the multilingualism in Luxembourg's schools poses a difficulty to their child's learning (see *Figure 8*). When it comes to supporting their child's learning, most parents of all five groups (rather) agreed that teachers and themselves as parents (or legal guardians) are responsible to support the children in their school learning. With respect to their own language skills in their child's language of literacy acquisition, the majority of parents across all groups (rather) perceived themselves as able to communicate effectively with their child's teacher and to support their child academically. It does, however, become apparent that considerably more parents of the ALPHA-French group had the perception that they are (rather) able to support their child in French when compared to parents from the ALPHA-French reference group who perceived themselves less able to support their child in German.

4.3 STATISTICAL AND METHODOLOGICAL LIMITATIONS

The findings of the present report represent a first evaluation of the pilot project "Zesumme wuessen!". However, they should be interpreted with caution due to a number of **important statistical and methodological limitations**, that have been described throughout this report as well as in the previous reports. The most relevant limitations are summarized below, as it is important to take them into account when interpreting the results.

As can be seen in *Table 2*, the ALPHA-French group consisted of $N = 37$ and the ALPHA-German group of $N = 46$ students. This **very small sample size** significantly limits the interpretability of the results, as the presence of statistical outliers (i.e., students with a very high or low share of correctly answered items) can impact the group average more strongly than in bigger samples. In addition, the small N s in the pilot project do not allow to analyse students based on a combination of individual background characteristics (e.g., students with a Portuguese language background and/or a low-SES) that have repeatedly been found to be at a particular risk of struggling academically in schools following the Luxembourgish curriculum.

Due to the very small number of ALPHA-French students and the fact that these students are the only ones who participated in the French version of the respective language tests in schools following the Luxembourgish curriculum, it is currently **not possible to scale the French language test scores** on the established ÉpStan metric. This implies that it cannot be determined whether the German and French language test versions are conclusively comparable in empirical difficulty.

Furthermore, the current results are limited to descriptive values (i.e., average of the percentage of correctly solved items) as a **longitudinal investigation** of the students' development in mathematics and in listening comprehension (two key areas assessed in both C2.1 and C3.1) **is currently not possible** due to the difference in levels of theoretical item difficulty between the two test time points (i.e., two levels in C2.1 and three levels in C3.1) and the fact that the tests are not anchored on the same metric, which means that it is not possible to make reliable statements about learning gains between C2.1 and C3.1.

4.4 INTEGRATION OF FINDINGS AND OUTLOOK

Findings from the first full cohort that started literacy acquisition in the scope of the “ALPHA – zesumme wuessen” pilot project in C2.1 of the school year 2023/24, presented in more detail in Colling et al. (2024), offered a first indication that students from the ALPHA-French group showed better results in both ÉpStan tests assessing their language of literacy acquisition (i.e. French listening comprehension and French early literacy skills). This advantage was especially pronounced for listening comprehension, when compared to the ALPHA-French reference group consisting of students with comparable background characteristics. However, the findings from this student cohort in C3.1 in the school year 2025/26 **indicate comparable achievement results** for all students irrespective of their language of literacy acquisition.

In addition to the pilot project ALPHA, the government has introduced greater flexibility regarding the main language of instruction through the establishment of the European Public Schools (EPS). Similar to ALPHA, these schools are being progressively integrated into the ÉpStan programme. The ÉpStan-EPS results indicate that offering students the possibility to learn in a language that is linguistically closer to their home language background may foster their academic achievement. The preliminary ÉpStan results for mathematics in C3.1 were in favour of students attending EPS at the comparable grade level of P3 as well as in their language of literacy acquisition in P1, which corresponds to C2.1 (Colling et al., 2025). These findings differ in comparison to those from the pilot project ALPHA.

One potential explanation for the divergent findings between EPS and the pilot project “ALPHA – zesumme wuessen” may lie in the different roles that these two approaches assign to the respective languages of instruction as well as to language **teaching practices** (e.g., amount of exposure, teaching materials, school curriculum). In EPS, students select one main language of instruction, which

is also predominantly used in other subjects. In contrast, the pilot project is more closely aligned with the structure of the regular trilingual Luxembourgish school system, where Luxembourgish is the main language of instruction in *Cycle 1*. In *Cycle 2*, either German or French becomes the language of literacy acquisition, while oral skills in the students' respective additional (second or third) language are introduced simultaneously, with the aim at giving both languages - German and French - equal value by the end of primary school. Within the pilot project classes, students are grouped by their language of literacy acquisition for the language subjects and, potentially, for mathematics (depending on the respective school's decision). Luxembourgish has a special role, considering that the so-called side subjects (e.g., introduction to science, introduction to art and culture, living together and values, sports; MENJE, 2023) are taught orally in Luxembourgish while written materials and visual supports are provided in the students' respective language of literacy acquisition.

The students in the ALPHA-French and ALPHA-German group are thereby less frequently exposed to their respective language of literacy acquisition than EPS students, who follow their educational trajectory in mainly one language across the different subjects. Although Luxembourgish has a prominent standing in the pilot project and has also been identified as the main language of communication between peers (Colling et al., 2024) - an asset as such¹³, particularly in a highly diverse student population this might come with **a trade-off** when it comes to achievement in their language of literacy acquisition. This is particularly relevant in light of international research showing that dedicated **time-on-task and exposure time to the target language** which students are learning have an impact on early primary school achievement (Godwin et al., 2021; Uhl et al., 2023).

Although the student population in EPS differs considerably from the student population in schools following the Luxembourgish curriculum, the policy approach of offering students the opportunity to learn in a language that is linguistically closer to their home language background was found to be successful (Colling et al., 2025). However, it might not be directly transferable to the highly diverse and multilingual setting that is characteristic for schools following the Luxembourgish curriculum, where students are typically exposed to and learn three languages from an early age. In this regard, the language of literacy acquisition plays a central role. **Prior knowledge of the language** of literacy acquisition facilitates learning to read and write (Babayiğit & Shapiro, 2020; Hogan et al., 2014). In this context, in the French language track, EPS students predominantly speak French at home, whereas for ALPHA-French students Portuguese has been identified as the language predominantly spoken at home (see *Table 2*). Many students attending a French language section in EPS are thus learning to read and write in their actual home language. This does not apply to the majority of ALPHA-French students. However, these students are predominantly exposed to the French language through media

¹³ In this context, it would be interesting to generate a deeper understanding of students' academic achievement in Luxembourgish. Considering that the ÉpStan assess Luxembourgish achievement only in C2.1, such an analysis is, however, not feasible within this context.

consumption (e.g., storytelling, audio books and movies; see Colling et al., 2024), which may contribute to a larger vocabulary and stronger comprehension skills in their language of literacy acquisition (i.e., French) compared to their considerably lower exposure to Luxembourgish and German.

Compared to EPS, schools following the Luxembourgish curriculum differ considerably in their student population with EPS students having a higher mean **SES** another factor that is known to influence literacy acquisition (Locke et al., 2002) and student achievement (Caldas & Bankston, 1997; Opdenakker & Damme, 2001; Sirin, 2005; Sykes & Kuyper, 2013; Yigiter, 2025). Furthermore, in a study that investigated the effects of **classroom composition** on academic achievement in relation to SES, Hornstra et al. (2015) discussed, that teachers might lower the instructional level in classes with a higher share of students with a low SES and that low-SES students might generally be more sensitive to contextual classroom effects (e.g., class size, didactical approaches, instruction quality) than their peers with a high SES, which might in turn result in achievement differences.

In addition to the contextual differences between the EPS and the pilot project ALPHA, the interpretation of group comparisons within the ALPHA project should also take into account that students learn to read and write in **different orthographic systems** (French vs. German). Research on (second) literacy acquisition across different languages has shown that French has a relatively opaque writing system compared to German (Hayes-Harb & Barrios, 2021). French has, for example, more inconsistent grapheme–phoneme correspondences, which means that the same letters can be pronounced in different ways and that the same sounds can be represented by different spellings. Studies comparing opaque and more transparent languages (such as German) showed that these language characteristics influence the reading strategies students' need to apply and that in French, students are facing higher decoding demands and thus need to rely more strongly on lexical decoding strategies (De León Rodríguez et al., 2016).

In this context, learning to read and write in a more opaque language can thus impact the **pace and visibility of the students' reading progress**. A research study comparing literacy acquisition across 13 European orthographies showed that the learning progress of students is less linear in opaque languages (e.g., French or English) with word recognition and decoding occurring more slowly than in more transparent languages such as German (Seymour et al., 2003). In opaque languages, students may need to develop a broader set of foundational literacy skills, potentially delaying their observable progress in the early years before deeper listening and reading comprehension skills develop. Early learning may therefore appear slower, even though these competences lay the groundwork for later development that may become visible at a later stage than in more transparent languages. In order to understand whether ALPHA-French students would develop more favorably in their language of literacy over time compared to the ALPHA-French reference group would, however, need additional

more fine-grained research and continuous monitoring with shorter intervals of the students taking part in the pilot project.

The findings that ALPHA-French students systematically expressed a **higher domain-specific motivation to learn and to read in their language of literacy acquisition** than students from the other groups and that more parents of ALPHA-French **perceived themselves able to support their child academically** due to their own language skills in French compared to the parents of students from the ALPHA-French reference group are promising. Although reading motivation and parental support were positively associated to achievement in other studies (Bakker et al., 2007; Boonk et al., 2018; Schiefele et al., 2016), it can currently not be concluded whether this higher motivation relates to higher achievement among ALPHA-French students.

In summary, the currently available ÉpStan data for the first cohort that has started literacy acquisition in the scope of the pilot project “ALPHA – zesumme wuessen” in C2.1 in the school year 2023/24 and that was assessed a second time in C3.1 in the school year 2025/26 do **not provide any indication of systematic performance differences between students groups in relation to their language of literacy acquisition.**

Due to the **limited sample size and resulting methodological limitations**, the present results do not allow for further conclusions to be drawn regarding the effectiveness of a literacy acquisition in a language that is linguistically closer to the students' home language background. Therefore, further data should be collected within different (e.g., more heterogenous populations regarding SES and home languages) and **larger samples** (e.g., allowing to properly scale and thereby compare the achievement results from tests in different language versions). Importantly, Jaekel and colleagues (2003) emphasize that students in more linguistically diverse classrooms also tend to show lower performance in the language of instruction. In light of these findings, it is essential to consider students' linguistic distance, particularly in relation to the language of literacy acquisition, in order to better address the needs of multilingual learners (Jaekel et al., 2023). In addition, longitudinal analyses (e.g., in C4.1) in combination with larger samples, would allow to investigate whether potential achievement differences in favour of ALPHA-French students compared to their reference group might become visible only at a later stage of their educational trajectory as suggested by findings from Seymour et al. (2003). In addition, the ÉpStan data that will be collected in C4.1, will give a first indication of how students from the ALPHA-French group perform not only in their language of literacy acquisition (i.e., French), but also in German. Furthermore, differences in pedagogical approaches (e.g., increased exposure to the students' language of literacy acquisition also in side subjects) should be explored to provide data for well-founded educational policy decisions that could contribute to reducing existing educational inequalities.

Overall, it should be noted that the present data does not offer any insight into how the current results would generalize beyond the specific conditions of the current pilot project. Aspects such as the composition of the student population with regard to their language backgrounds (e.g., native speakers vs. students learning to read and write in a language that is linguistically closer or distant to their home language background), the intensity and structure of instructional support (e.g., collaboration network between pilot schools), the motivation, experience and training of teachers (e.g., specific professional development and support on didactical specificities of teaching literacy acquisition in French), as well as the broader classroom and school environment (e.g., pilot schools characterized by a lower SES than students at national level), may differ considerably in other contexts or at a larger national scale.

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APPENDIX

DESCRIPTIVES OF THE ÉPSTAN COHORT FOR THE 2023/24 SCHOOL YEAR (REPORT 2024)

Table A.3 provides the detailed sample description for the full cohort of students that were assessed in C2.1 in the scope of the ÉpStan 2023/24 and based on which the first evaluation results for the pilot project were published in the ALPHA Report 2024 (Colling et al., 2024).

Table A.3 – Detailed Sample Description of the ÉpStan Cohort for the 2023/24 School Year

	Language background						
	N	HISEI (M/SD)	% female	% natives	% Lux/German	% French	% Portuguese
"Zesumme wuessen!"							
ALPHA-French group	48	42 (17)	56 %	15 %	17 %	29 %	46 %
ALPHA-German group	65	44 (17)	43 %	42 %	42 %	11 %	29 %
Regular curriculum							
ALPHA-French reference group	240	43 (18)	56 %	13 %	17 %	27 %	52 %
ALPHA-German reference group	325	43 (17)	47 %	40 %	43 %	10 %	24 %
National level	5824	51 (16)	48 %	40 %	42 %	21 %	23 %

Note. N = Number of students. HISEI = Highest international Socio-Economic Index of Occupational Status. In addition to the HISEI mean (M), the standard deviation (SD) is indicated in brackets.

ROBUSTNESS CHECK OF THE C3.1 RESULTS VIA ALTERNATIVE REFERENCE GROUPS

As discussed in more detail in section 3.1 of the present report, the descriptives demographics indicate that the ALPHA-French and the ALPHA-German group now differ slightly more from their respective statistical reference groups in terms of background characteristics (see Table 2) than at the initial time point of matching in C2.1, which is likely explained by the different attrition and grade repetition rates observed in these groups (e.g., higher grade retention rate in the ALPHA-French reference group when compared to the ALPHA-French group).

Although deviating from the initial longitudinal analysis approach of the report (e.g., monitoring how C2.1 students assessed in the ÉpStan 2023/24 develop in their academic achievement over time until their second assessment in the ÉpStan 2025/26), we tested the robustness of the findings presented in the results section of the present report by computing two alternative reference groups for the ALPHA-French and ALPHA-German students using the exact same propensity score matching approach as before. In contrast to the previous reference groups, these two alternative reference groups now only considered the $N = 37$ ALPHA-French students and $N = 46$ ALPHA-German students with regular trajectories from C2.1 to C3.1 (i.e., they did not repeat grades in this time period nor moved to schools that are not participating in the ÉpStan) and identified five statistical twins for each of these students that had also regular trajectories between C2.1 and C3.1.

Table A.4 illustrates the demographics for these two alternative reference groups and as can be seen when looking, for example, at the groups' HISEI, the ALPHA-French group and its reference group show 1 HISEI point difference compared to 4 as found when using the initial reference group (Table 2). Similar patterns can be observed when looking at language background.

Table A.4 –Detailed Sample Description of the Two Alternative Reference Groups Based on Student with Regular Trajectories

					Language background		
	N	HISEI (M/SD)	% female	% natives	% Lux/German	% French	% Portuguese
"Zesumme wuessen!"							
ALPHA-French group	37	42 (17)	51 %	14 %	16 %	27 %	43 %
ALPHA-German group	46	46 (17)	46 %	46 %	52 %	13 %	24 %
Regular curriculum							
Alternative ALPHA-French reference group	185	43 (17)	51 %	14 %	17 %	27 %	44 %
Alternative ALPHA-German reference group	230	44 (17)	47 %	44 %	52 %	15 %	23 %
National level	4769	53 (16)	49 %	44 %	46 %	21 %	19 %

Note. N = Number of students. HISEI = Highest international Socio-Economic Index of Occupational Status. In addition to the HISEI mean (M), the standard deviation (SD) is indicated in brackets.

Despite this stronger alignment in background characteristics for the two alternative reference groups, the academic achievement results across all three competence domains did only result in very small changes in the percentages of correctly answered items at both levels (e.g., from -3 to +1 for students in the alternative ALPHA-French reference group). The overall pattern of comparable achievement results between students from all five groups, irrespective of their language of literacy acquisition can, thus, also be found with these alternatively matched students (i.e., group differences that are not exceeding 10 %). These findings support the robustness of the initial propensity matching approach, particularly in light of the fact that 114 statistical twins were identified in the alternative ALPHA-French reference group that were not identified as statistical twins in the initial C2.1 reference group and the same applies to 172 twins in the alternative ALPHA-German reference group. This illustrates the strong impact that attrition (due to grade repetition or system leavers) has on the statistical sample composition via propensity score matching.

The following figures illustrate the findings for the alternative reference groups for each achievement domain. When interpreting these figures, it should be noted that they only serve as robustness check for all the initial findings presented in the report and not as independent analyses. This is due to the fact that the small sample size of students participating in the ALPHA pilot project does not allow to control for C2.1 students' differences in academic achievement, which could, for example, have been done in the scope of a regression analysis in the presence of a bigger sample, and the fact that the students in the alternative reference groups already showed stronger descriptive results in C2.1 compared to the initial reference groups. Including the C2.1 achievement scores in the propensity score matching is also not possible as alternative reference groups would have to be computed for each achievement test completed in C2.1¹⁴, resulting in an abundance of reference groups and decreasing comparability.

¹⁴ It should be noted, that there are additional limitations to take into account while considering these analyses, such as for instance, differences in test language within and across C2.1 and C3.1. In combination with the small sample size, the scope of further analyses that could be conducted is thus constrained.

Figure A.10 – Robustness Check of Achievement Results in Mathematics in C3.1 (Alternative Reference Groups)



Note. 12 items are at Level 1 (a 10% difference corresponds to 1.2 additional correct answer on average); 29 items are at Level 2 and 29 items are at level 3 (a 10% difference corresponds to 2.9 additional correct answers on average).

Figure A.11 – Robustness Check of Achievement Results in Listening Comprehension in C3.1 (Alternative Reference Groups)



Note. 13 items are at Level 1 and Level 2 (a 10% difference corresponds to 1.3 additional correct answer on average), and 9 items are at level 3 (a 10% difference corresponds to 0.9 additional correct answer on average).

Figure A.12 – Robustness Check of Achievement Results in Reading Comprehension in C3.1 (Alternative Reference Groups)



Note. 8 items are at Level 1 (a 10% difference corresponds to 0.8 additional correct answers on average), 16 items are at Level 2 (a 10% difference corresponds to 1.6 additional correct answers on average), and 6 items are at level 3 (a 10% difference corresponds to 0.6 additional correct answer on average).

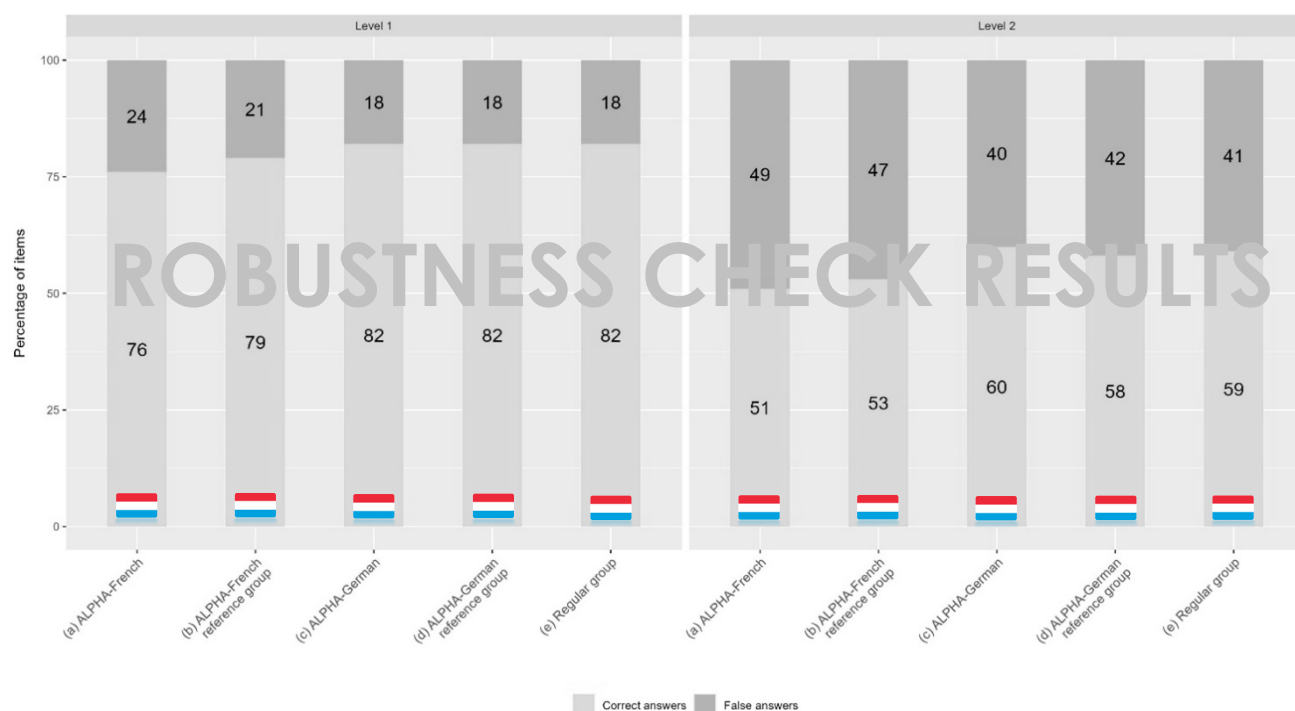
For transparency reasons and to illustrate how the students of these alternative reference groups including only students with regular trajectories between C2.1 and C3.1 performed in C2.1, the following figures are included to illustrate C2.1 group differences (e.g., smaller differences between the ALPHA-French students and their peers in the ALPHA-French reference group than for the full sample observed in the ALPHA 2024 report, for example, in listening comprehension).

Illustration A3 - Overview of the test language per academic achievement test for the ALPHA-French and ALPHA-German group in Cycle 2.¹⁵

	Mathematics	Listening Comprehension	Early Literacy
Groups			
ALPHA-French			
ALPHA-German			

¹⁵ At the national level, the test language used for the regular group, including the reference groups, was identical to the test language used for the ALPHA-German group. The C2.1 tests are described in detail in the ALPHA 2024 report.

Figure A.13 – Robustness Check of C2.1 Results in Mathematics (Alternative Reference Groups)



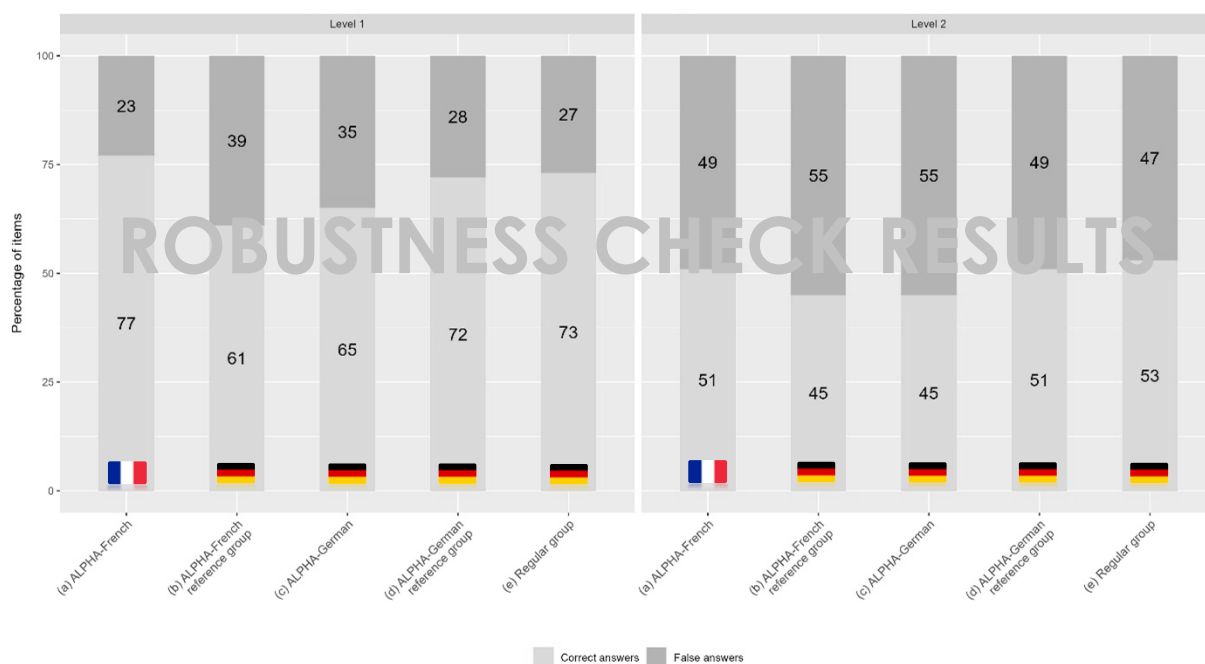
Note. 21 items are at Level 1 (a 10% difference corresponds to 2.1 additional correct answers on average) and 16 items are at Level 2 (a 10% difference corresponds to 1.6 additional correct answers on average).

Figure A.14 – Robustness Check of C2.1 Results in Luxembourgish Listening Comprehension (Alternative Reference Groups)



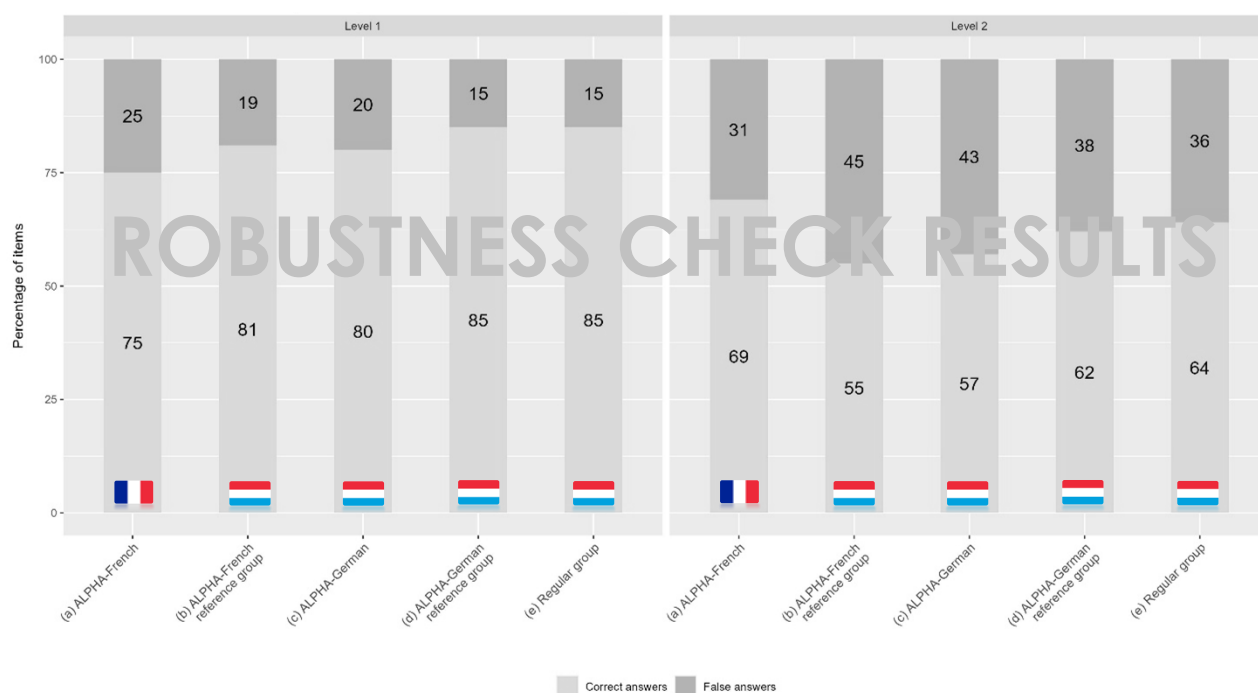
Note. 14 items are at Level 1 (a 10% difference corresponds to 1.4 additional correct answers on average) and 12 items are at Level 2 (a 10% difference corresponds to 1.2 additional correct answers on average).

Figure A.15 – Robustness Check of C2.1 Results in Listening Comprehension in the Language of Literacy Acquisition (Alternative Reference Groups)



Note. In the 2023/24 ÉpStan, the French and German listening comprehension tests differed in the number and composition of items. Therefore, comparisons between the French and German test results should be interpreted with caution. The French listening comprehension test comprised 21 items at Level 1 (a 10% difference corresponds to 2.1 additional correct answers on average) and 11 items at Level 2 (a 10% difference corresponds to 1.1 additional correct answers on average). The German listening comprehension test comprised 18 items at Level 1 (a 10% difference corresponds to 1.8 additional correct answers on average) and 13 items at Level 2 (a 10% difference corresponds to 1.3 additional correct answers on average).

Figure A.16 – Robustness Check of C2.1 Results in Early Literacy in the Language of Literacy Acquisition (Alternative Reference Groups)



Note. In the 2023/24 ÉpStan, the French and Luxembourgish early literacy tests differed in the number and composition of items. Therefore, comparisons between the French and Luxembourgish test results should be interpreted with caution. The French early literacy test comprised 22 items at level 1 (a 10% difference corresponds to approximately 2.2 additional correct answers on average) and 20 items at level 2 (a 10% difference corresponds to approximately 2 additional correct answers on average). The Luxembourgish test comprised 25 items at Level 1 (a 10% difference corresponds to approximately 2.5 additional correct answers on average) and 18 items at Level 2 (a 10% difference corresponds to approximately 1.8 additional correct answers on average).

