RESEARCH ARTICLE

The relationship between secondary school course choices, language proficiency and academic performance among Swedish pharmacy students

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Abstract

Background: Merely half of the students who enrol in the pharmacy programme at the University of Gothenburg in Sweden graduate in time. Papers submitted by the students enrolled in the programme reveal linguistic deficiencies. To gain university admission, students must achieve passing grades in Swedish (SFL) or Swedish as a Second Language (SAS). **Objective:** This study aimed to investigate Swedish language proficiency and its correlation to the academic performance of pharmacy students. **Methods:** In this cross-sectional study, Swedish language proficiency among pharmacy students was assessed using four approaches: tests (grammar, vocabulary, listening and reading comprehension), assessments of oral and written communication, and Swedish language admission grades. Academic performance was defined as the percentage of credits completed in the programme after one year and was correlated with language competence. **Results:** SFL students scored higher than SAS in Swedish tests and assessments. Admission grades did not differ significantly between language groups and did not correlate with tests, assessments, or academic performance. However, language testing and assessments correlated with academic performance. **Conclusion:** Many pharmacy students did not meet the expected level of Swedish proficiency and skills needed to perform course tasks adequately, with SAS students overrepresented. Admission grades in Swedish were not a reliable predictor of Swedish proficiency or academic performance.

Introduction

A student's mastery of the language used in teaching can enhance academic success in higher education (Phakiti, 2008; Oliver *et al*., 2012; Neumann *et al*., 2019; Bo *et al*., 2022). Previous studies have shown that standardised language proficiency tests, such as the International English Language Testing System (IELTS, 1980) correlate positively with academic performance in tertiary education, both in foreign (Phakiti, 2008; Oliver *et al*., 2012; Neumann *et al*., 2019) and domestic students (Bo *et al*., 2022). Additionally, self-perceived language proficiency has been shown to correlate

positively with grade point averages (GPAs) (Martirosyan *et al*., 2015).

The Swedish pharmacy programme comprises five years of full-time university studies, resulting in a pharmacist degree, and includes courses in chemistry, biomedicine, and medical and pharmaceutical sciences. The programme is popular among students who have a foreign background (Statistics Sweden (SCB), 2022), yet it is taught in Swedish, with English course literature. Only half of the enrolled pharmacy students now graduate with a pharmacy degree, which is part of a continuous decline in pharmacy graduates (Statistics Sweden (SCB), 2023). In the U.S., pharmacy student

attrition has also increased but not to such a dire extent, with 86.4% of the students graduating in time in 2021 (Robinson *et al*., 2023).

In Sweden, residents aiming to enrol in tertiary education often take the Swedish Scholastic Assessment Test (SweSAT). A recent analysis of test results between 2012 and 2018 revealed a substantial decrease in Swedish reading comprehension and an increase in English reading comprehension (Löwenadler, 2023). As a potential indicator of success for future pharmacy students, 15-year-old Swedes who participated in the 2022 edition of the Programme for International Student Assessment (PISA) in reading, demonstrated a higher long-term decline in reading scores as well as a higher difference observed between indigenous and foreign students compared to students from other OECD countries (Swedish National Agency for Education, 2023).

Lecturers in the pharmacy programme have also raised concerns about the students' declining language proficiency, referring to their ability to comprehend written and spoken information in Swedish and English (languages required for the program) and their capacity to effectively communicate knowledge in oral and written examinations. One of the authors (SL) has expressed concern that at least half of the texts submitted in the second semester exhibited significant language issues, with a quarter of them being so poorly written that it was difficult to discern the student's intended meaning.

Contrary to the lecturers' concerns about the pharmacy programme students' declining language proficiency, there are no readily identifiable changes in the grades from upper secondary school in the corresponding admission statistics (Swedish Council for Higher Education (UHR), 2024). This could be a sign of grade inflation, wherein high grades do not reflect improved student performance (Edmark & Persson, 2021; Yeritsyan *et al*., 2022).

Students enrolled in the pharmacy programme must have taken and passed certain upper secondary school courses as prerequisites, including Swedish, English, biology, physics, and chemistry. However, once admitted into the programme, there are no tests or examinations on language skills; Swedish and English are considered tools for achieving course-related learning outcomes. Therefore, the impact of language proficiency on other parameters, such as academic performance, has previously been based on their upper secondary school grades. However, these grades may not accurately reflect actual proficiency due to grade inflation.

The present study conducted a validated language test during the second semester. The students' proficiency in Swedish was further evaluated through learning activities such as oral presentations and written essays. These results were then compared to their upper secondary school Swedish grades, which were used for admission, and their academic performance after one year in the pharmacy program. The students could have completed one of three different, legally equivalent types of upper secondary school courses before enrolment namely Swedish (SFL), the old (pre-2011) SFL or Swedish as a Second Language (SAS). Each of these options includes a series of three courses that the students typically must complete to qualify for any tertiary education.

This study aimed to investigate the Swedish language proficiency of newly enrolled and active students, determine variations in proficiency based on the type of Swedish course completed in upper secondary school, and determine the correlation between Swedish skills and admission grades, and academic performance in the pharmacy programme.

Ethical approval

The Swedish ethics review committee concluded that the project did not fall under the ethics review act, and therefore did not require an ethics approval to be published (Etikprövningsenheten Uppsala Dnr: 2023-01556-01).

Methods

This cross-sectional study investigated the connection between Swedish language proficiency and academic performance during the first year of the pharmacy programme at the University of Gothenburg, Sweden.

Student group

Students enrolled in either the first course of the second semester of the pharmacy programme (where a voluntary Swedish language test was offered) or in the third course of the second semester (where their Swedish skills were assessed through an oral presentation and a short essay) in 2023 were included. Focusing on first-year students allowed the assessment of their language proficiency before they pause or end their participation in the pharmacy programme, enabling data collection on academic performance. Also, concentrating on students in the second semester, this study could reduce statistical noise arising from students dropping out early due to factors likely unrelated to language issues such as programme switching. Lastly, the over-representation of struggling students was avoided by excluding those who re-

registered for the first semester and those who did not participate later in the semester. Several mandatory learning activities awarded students some credits for participation without requiring them to complete the written end-of-course exam. Therefore, non-

participation was defined as earning zero credits during the semester. A total of 81 students were included in this study after exclusions. Figure 1 shows a flow chart detailing the inclusions and the exclusions process.

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110 students registered on course CEB210 and/or had language assessed in course CEB230.

29 students excluded:
-14 re-registered on course CEB210.
-15 students non-participation in semester.

81 students remaining after exclusions:
-1.2% (n = 1) SFL old system.
-51.9% (n = 42) SFL new system.
-46.9% (n = 38) SAS.

Credits data for 100% of students (n = 81) was collected, and percentage of maximum achievable credits in the first year of the pharmacy program was calculated.
-38.3% (n = 31) achieved 100% of possible credits during first year of pharmacy program.

Grade data was collected for 100% of students (n =81).
-1 student had below passing Swedish grade (score of 0).

81-80=1 student excluded excluded in analyses involving involving Swedish grades.

CEB210 language tests was taken by 51.9% of students (n = 42).

81-42=39 students excluded in analyses involving involving language test data.

Language in oral presentation and written assay was assessed for 98.8% of students (n = 80).

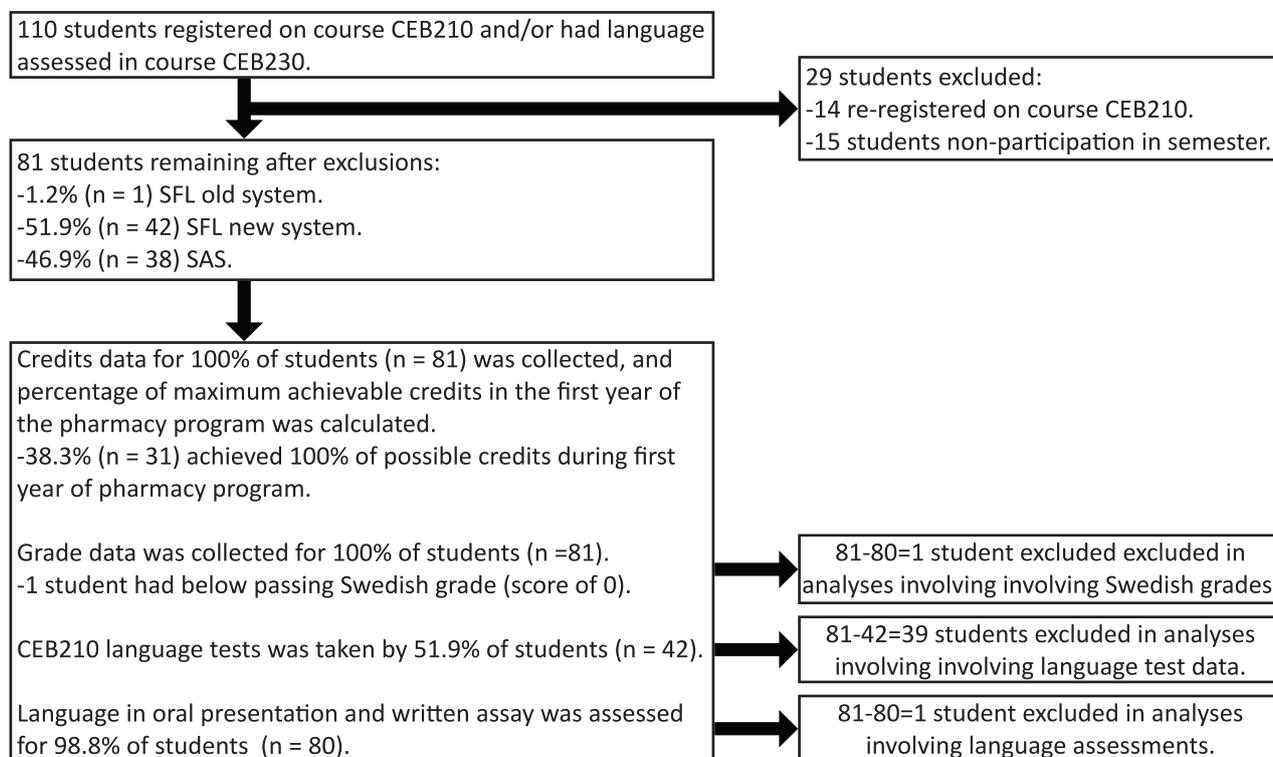81-80=1 student excluded in analyses involving language assessments.

Figure 1: Flowchart of student inclusions, exclusions, characteristics, and data gathering. CEB210 = the first course of the second semester in the pharmacy programme. CEB230 = the third course of the second semester in the pharmacy programme. SFL = Swedish course in upper secondary school. SAS = The Swedish as a second language course in upper secondary school.

Evaluation of Swedish skills

Swedish language test

Students enrolled in the first course of the second semester (course code CEB210) were allowed to participate in a language test (https://www.eurotest.me/en/om-testen). The test was based on the Common European Framework of Reference for Languages (CEFR), with levels ranging from A1 (beginner level) to C2 (advanced). Enrolled students are expected to attain the C1 and C2 levels. Only results from three sections, i.e. 1) Grammar and vocabulary; 2) Reading comprehension; and 3) Listening comprehension were included in the analysis as they are based on multiple-choice questions. The other sections were excluded since they were self-evaluative and therefore less objective.

Despite Swedish law not requiring ethical approval for analysing academic test results, only test results from students who gave written informed consent were included. This decision was made to ensure that students were not dissuaded from taking the voluntary Swedish test due to concerns about participating in the study. Another purpose of offering this diagnostic test was to raise student awareness of their Swedish proficiency.

Language assessments

Oral and written communication were assessed during the third course (course code CEB230) during the second semester. Oral communication proficiency in Swedish was graded by the teacher/examiner based on a five-minute oral presentation. The students were assigned a score of one (best) or two (worst), using the following rubric:

1) clear and easy to understand or

2) difficult to understand.

The scores from the Swedish test (reading and listening comprehension and grammar), credits (academic performance), and the type of upper secondary course completed (SFL or SAS) were unknown to the assessing teacher to reduce grading bias. The Grades for the oral presentation were mainly based on content. The oral communication proficiency scores used for the study were only a minor part of the overall assessment. The criteria for passing were as follows: 1) the content was correct and in line with the instructions; 2) the presentation provided a good overview of the scientific article; 3) the molecular aspects were clear; 4) slides were understandable with students pointing at the presentation and looking at the audience at least once; 5) the oral communication was well understood.

Students who failed the oral presentation were advised on improving and availed a second chance within a short time. No student failed the second attempt of the oral presentation. Thus, no direct link existed between poor oral communication proficiency and the study results used for the evaluation of academic performance after one year on the programme.

Written communication proficiency in Swedish was graded based on a short essay of approximately 3000 characters. Scores ranged from one (best) to three (worst) according to the following rubric:

1) good: only a few linguistic errors of low consequence, e.g. faulty use of closed and open compounds;

2) acceptable: some grammatical errors but possible for a reader to understand without guessing;

3) poor: difficult to read or understand due to major errors in the text.

The students were instructed to use spelling and grammar checks in their word processors before submitting their essays. The teacher assessing written communication did not have access to the students' Swedish test scores, academic credits, or Swedish background (SFL or SAS), which helped minimise bias.

The grades were primarily based on content, with the written communication proficiency score used for the study being only a minor subset of the overall assessment. The criteria for a passing grade were as follows: 1) The content was correct and in line with the instructions; 2) the molecular aspects were clear; and 3) the text was clear and well understood without guessing.

Students who outrightly failed in the essay were previously advised on improvement and were allowed to re-attempt the essay three times. Only three students (4% of the cohort) failed after three attempts, and the learning activity only corresponded to two credits (3% of the total credits obtainable during the first year). Therefore, the effect of failing the essay on overall academic performance was minimal.

Admission grades and academic performance

Admission data, lists of students registered for the courses and study results from one year of full-time studies were pulled from the NyA admissions system and LADOK (National IT system for documentation of enrolment and results at higher education in Sweden), respectively. The NyA admissions system is owned, managed and developed by the University and College Council (UHR). The LADOK Consortium, comprised of Swedish universities, owns and manages LADOK.

Sub-group analysis

Sub-group analyses were performed to test whether some results differed depending on whether the students had taken SFL or SAS as Swedish courses in upper secondary school.

Data analysis

Data were analysed using R version 4.3.1 (R Core Team, 2020) with the tidyverse packages (Wickham *et al.*, 2019). The pseudonymised student data, script, and outputs are available on GitHub (https://github.com/mattias-erhardsson/pharmacy-education-sahlgrenska-language-article). Since all the data were either ordinal or categorical, non-parametric tests (Spearman rank correlation and the Mann-Whitney U) were done (du Prel *et al.*, 2010). Spearman's test was used to investigate the correlation between two ordinal variables, while Mann-Whitney U was utilised to determine if a variable differed between two groups. The *p*-values were adjusted using the Benjamini-Hochberg method (Benjamini & Hochberg, 1995). An adjusted $p < 0.05$ was considered significant.

Reporting checklist

The study adopted the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (Vandenbroucke *et al.*, 2007; von Elm *et al.*, 2007).

Results

Descriptive statistics

An overview of the data for this study is presented in a flowchart (Figure 1). Initially, the 110 students who were registered in the first course that contained the Swedish language-related learning activities were included in the study. However, 29 of these were then excluded due to lack of participation in the subsequent course during which oral and written communication skills were graded or due to being re-registered on the course. The remaining 81 students formed the cohort for this study.

In upper secondary school, about half (n = 38, 46.9%) of the students studied SAS, while the other completed SFL courses (grades 10-12). Of the SFL students, only one studied in the old system and the rest, in the new system. One student was excluded from all analyses involving Swedish grades from upper secondary school due to admission through alternative means.

Credits earned from studying the first year of the pharmacy programme were compiled for all 81 students. The maximum number of possible credits a student could earn in the first year is 60, following the European Credit Transfer and Accumulation System (ECTS). However, since eight (9.9%) students had completed at least one of the first-year courses or taken the same course in another programme or an equivalent course, an individual maximum was determined for each student. The percentage of this achievable maximum was calculated for each participant. Exactly 31 (38.3%) of the students achieved 100% of the possible credits.

In the first course of the second semester (CEB210), 42 (51.9%) students chose to take the voluntary Swedish language test, while the remaining 39 declined. In the third course of that semester (CEB230), the language assessments from oral presentations and essays were performed on 80 (98.8%) Students. The missing data point for the language assessment was due to one student's absence from the part of the course where the assessment was done.

Swedish proficiency gaps in the SAS group.

 Preliminary data evaluation indicated that students' attendance in SFL or SAS courses impacted other outcomes. Consequently, data were divided into these two groups for relevant analyses. The median admission grades in Swedish were 17.5 (Interquartile range (IQR) 3.33) for both SFL and SAS, respectively. The distribution of the grades can be seen in Figure 2A.

In the Swedish test, the percentages of students who reached the expected level (CEFR score C1 or C2) for university studies in the SFL group, were 30% for listening comprehension, 100% for reading comprehension and 100% for vocabulary and grammar knowledge as shown in Figure 2B. Meanwhile, the corresponding percentages for the SAS group were 11% for listening comprehension, 37% for reading comprehension and 58% for vocabulary and grammar knowledge (Figure 2B). No one in the SFL group had results corresponding to skill levels only just above basic level (B1), which in turn were present in the SAS group (37, 11 and 5%, respectively, Figure 2B). Exactly 37% of SAS students achieved B1 in at least one test. Thus, students obtained the best score (C2) among students from both SFL and SAS backgrounds, however, students with low scores were overrepresented in the SAS group ($p > 0.05$, Figure 2B). Both students with SFL and SAS backgrounds had better scores for both the reading comprehension and the grammar & vocabulary sub-tests compared to the listening comprehension test (adjusted $p < 0.05$). There was no significant difference in scores between the reading comprehension and the grammar & vocabulary sub-tests.

Many students in the pharmacy programme lacked sufficient Swedish skills to perform course tasks well, and these are overrepresented in the SAS group.

Half of the students with SAS backgrounds gave oral presentations that were assessed as difficult to understand (Figure 2C). Furthermore, in the SAS group, 37% of the written essays were assessed as difficult to understand, 45% as comprehensible despite grammatical issues, and 18% as good/containing only minor errors (Figure 2C). Among students with an SFL background, 2% were assessed as giving oral presentations that were difficult to understand, while 0% of the written essays were deemed as difficult to understand, 40% as comprehensible despite grammatical problems, and 60% as good/containing only minor errors (Figure 2C). Thus, some students obtained the best assessment scores in both written and oral communication among students from both SFL and SAS backgrounds, however, students assessed to be lacking sufficient skills to express themselves clearly in oral and written communication were overrepresented in the SAS group ($p > 0.05$, Figure 2C and D).
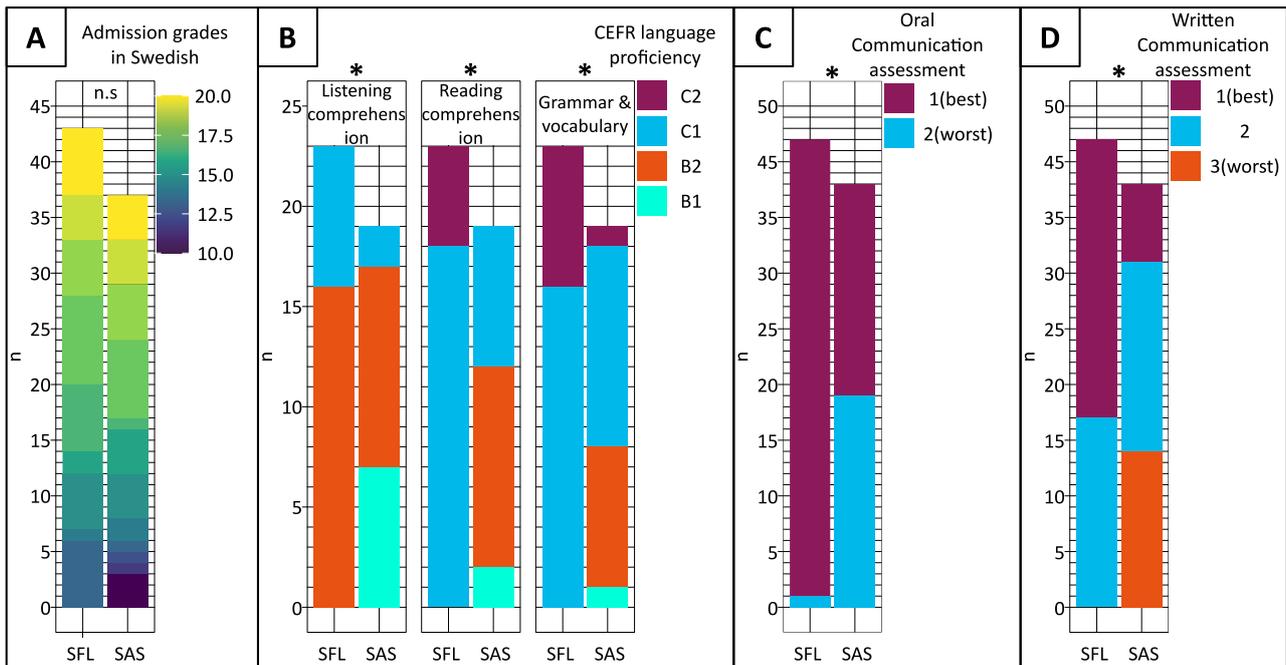
Figure 2: Swedish language proficiency is measured as (A) admission grades, (B) a language test, (C) oral communication or (D) written communication. SFL = Swedish course in upper secondary school. SAS = Swedish as a second language course in upper secondary school. n = Number of students. * = Significant difference between groups with the Mann-Whitney U test. n.s = no significant difference between groups.

Correlations in Swedish test results

The voluntary Swedish language test results were from B1 (worst) to B2, C1 and C2 (best). The results (C2, C1, B2, B1) were coded numerically (1, 2, 3, 4) to align with the range used in the language assessment scales, where a lower number indicates better Swedish proficiency. The coded test results were summed to obtain a single variable to correlate with since this preserves data granularity while enabling comparison with the combined variable for the language assessment, measured on a different scale. Similarly, written and oral communication were coded and summed.

The results from the Swedish test for the entire cohort (SAS + SFL) correlated with the written and oral communication skills assessments (Spearman's rho (ρ): 0.57; $p < 0.05$), as shown in Figure 3A. However, the upper secondary school grades in Swedish (SV) in the entire cohort did not correlate with the measures of Swedish language competence ($\rho = -0.030$, $p = 0.85$), as shown in Figure 3B.

Furthermore, dividing the students into SFL *vs* SAS still did not indicate an association between the Swedish test results and the admittance grades (SFL $\rho = 0.062$; $p = 0.82$ *vs* SAS $\rho = -0.14$; $p = 0.67$).
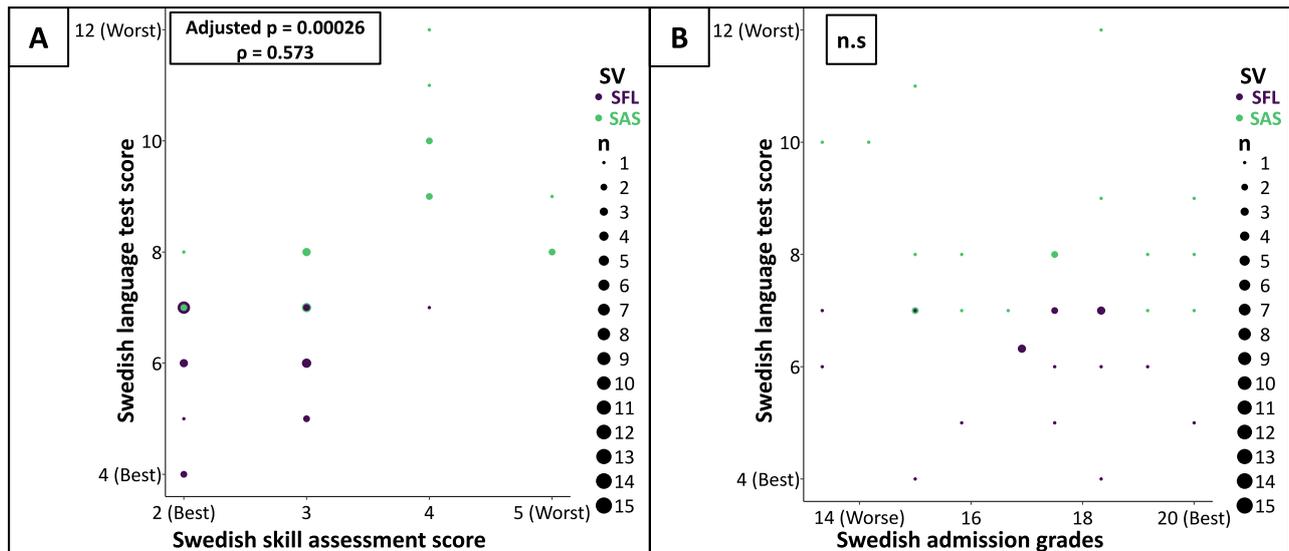
Figure 3: Dot plots and correlations of the voluntary Swedish language test, Swedish skill assessments and Swedish admission grades. The type of Swedish course the students took in upper secondary school (SAS = Swedish as a second language, or SFL = Swedish) is denoted by colour. Overlapping data is addressed through dot size which shows how many observations (n) there were for that combination of variables. Spearman's rank correlation was employed to test for statistical differences between groups. n.s = no significant difference between groups.

Correlation of Swedish language proficiency test and assessments

The correlation between different measures of Swedish proficiency in the entire cohort and the percentage of maximum pharmacy programme credits achieved was analysed. High academic performance was associated with better Swedish proficiency ($\rho = -0.34$; adjusted $p < 0.05$) as shown in Figure 4A. The negative ρ indicated that the Swedish test and language assessment scores inversely correlated to the numerical values.

The second measure of Swedish proficiency i.e. assessment of oral presentations and written essays, also showed a correlation between high language proficiency and better academic performance ($\rho = -0.25$; adjusted $p < 0.05$) (Figure 4B).

Combining the Swedish test scores and oral and written communication assessments was anticipated to yield a more robust indicator of students' Swedish language skills since these measures assessed different aspects. However, the combined measure yielded a similar correlation with academic performance ($\rho = -0.36$; adjusted $p < 0.05$) (Figure 4C). Overall, higher Swedish language proficiency skills (lower score) thus correlated with student academic performance. However, no significant correlation was found between the Swedish admission grades and the percentage of credits earned by the students in the first year of the pharmacy programme (adjusted $p > 0.05$) (Figure 4D).
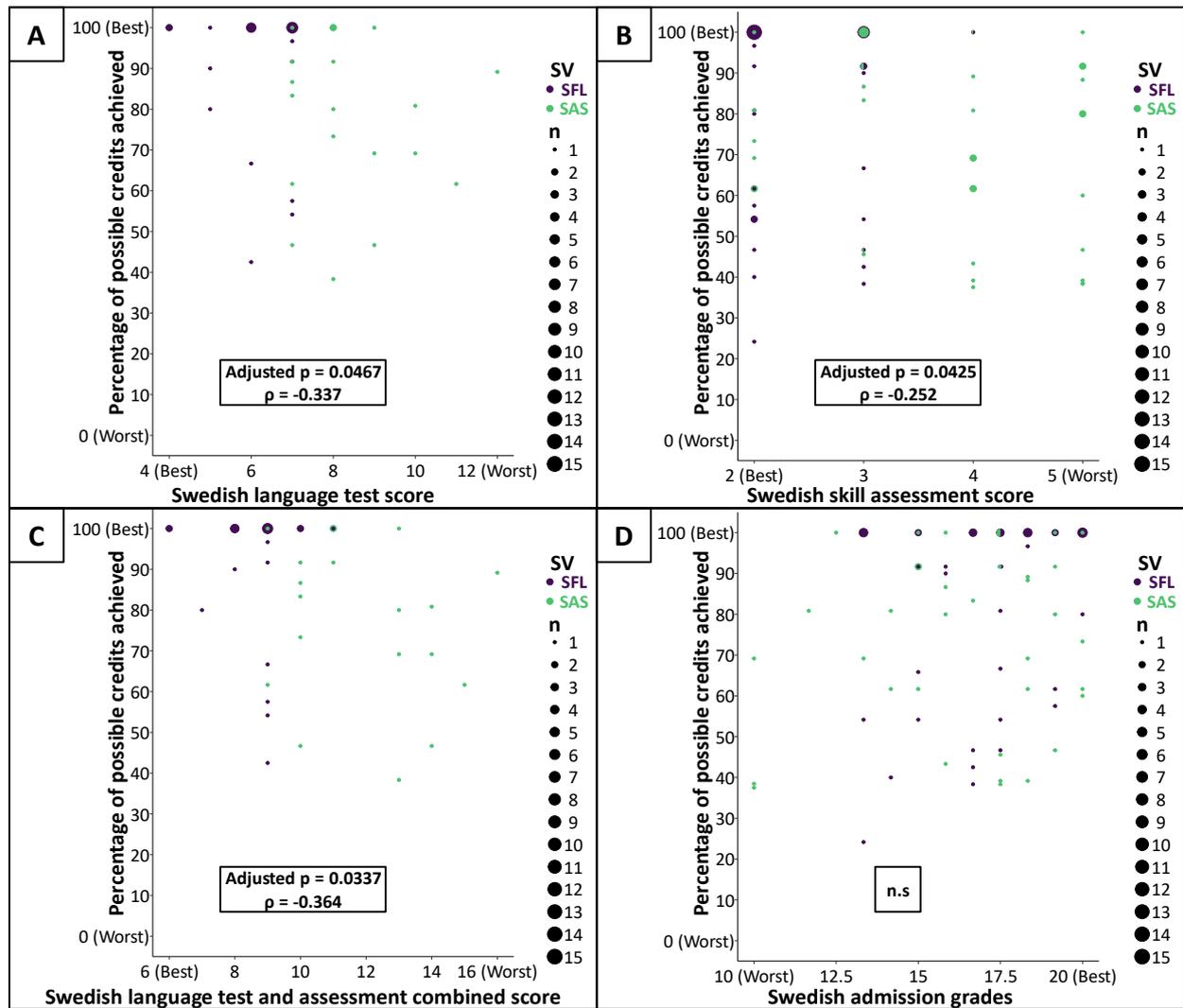
Figure 4: Dot plots correlating measures of Swedish competency with performance in the pharmacy programme. The type of Swedish course the students took in upper secondary school (SAS = Swedish as a second language, or SFL = Swedish) is denoted by colour. Overlapping data is addressed through dot size which shows how many observations (n) there were for that combination of variables. Spearman's rank correlation was employed to test for statistical differences between groups. n.s = no significant difference between groups.

The SFL students, as a group, performed better than the SAS students in the first year of the pharmacy programme (adjusted $p < 0.05$) (Figure 5A). Since the SAS group contained all but one of the students whose oral communication skills scored "2", written and oral communication assessments were analysed separately. The sub-group analysis indicated that the association between academic performance and oral communication (adjusted $p = 0.016$) (Figure 5B) was more clear-cut than the association with written essays (adjusted $p = 0.094$).

Since the most clear-cut correlation was between academic performance and oral assessment scores, the high data coverage for oral communication (98.8%) and academic performance (100%) were used to investigate

potential bias in the voluntary Swedish test dataset. Only 51.9% of the cohort participated, raising the possibility that students with lower communication skills might have opted out of the test. Although no statistically significant difference in oral communication scores was found between those who took the test and those who did not, a trend was observed ($p = 0.1$).

This trend suggests a bias in the dataset could have been detected if the number of participants was higher. This indicates that students who chose not to take the test may have had more difficulties with oral communication than those who participated (Figure 5C).
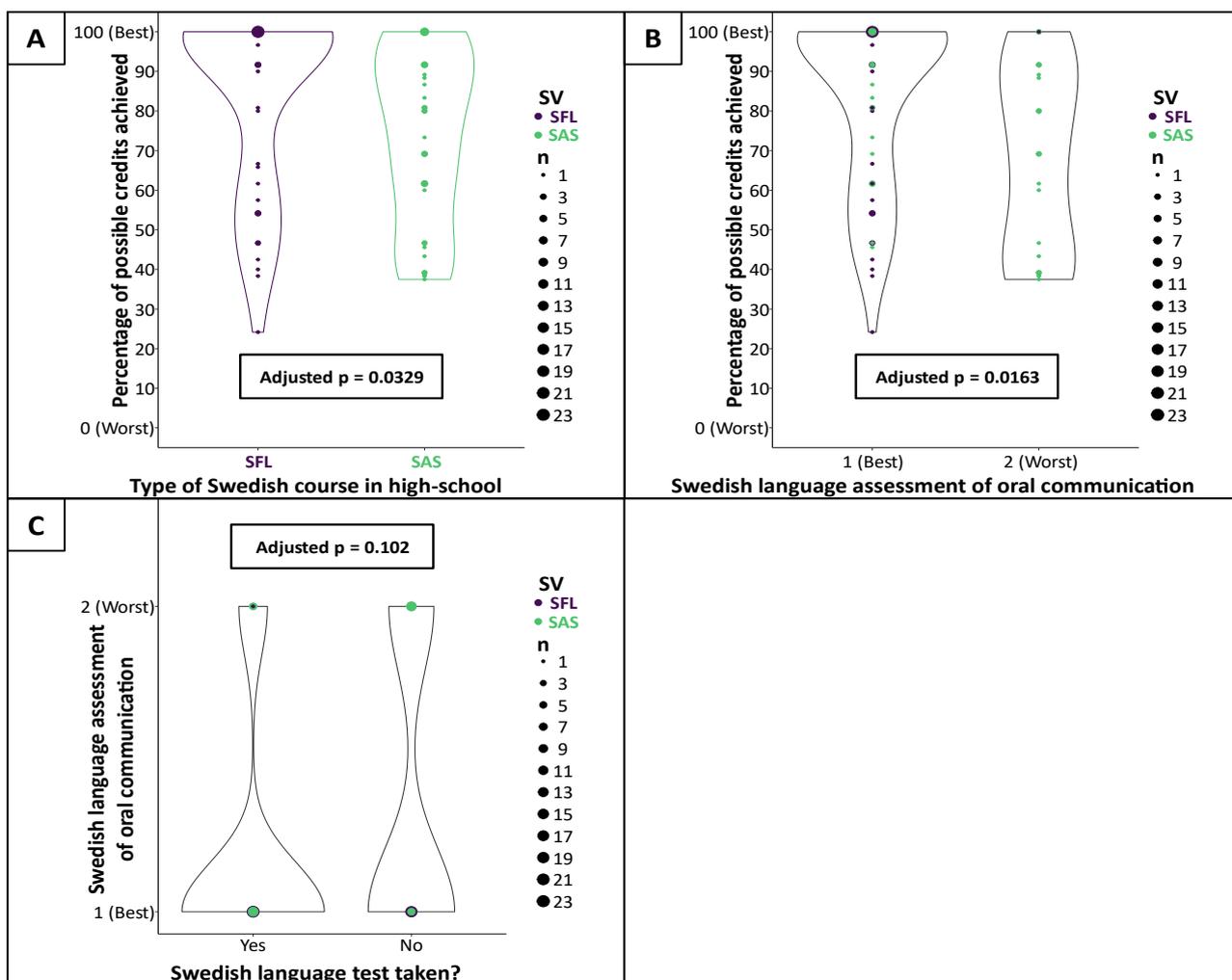
Figure 5: Dot- and violin plots of first-year academic performance in the pharmacy programme. The type of Swedish course the students took in upper secondary school (SAS = Swedish as a second language, or SFL = Swedish) is denoted by colour. Overlapping data is addressed through dot size which shows how many observations (n) there were for that combination of variables. Mann-Whitney U was employed to test for statistical differences between groups.

Discussion

This study highlights a positive correlation between low Swedish proficiency and poor academic performance among pharmacy students in Swedish university education. A quarter of the students wrote essays with a substantial number of grammatical errors making them difficult to understand without guessing. Also, a quarter of the students gave oral presentations that were hard to follow due to linguistic errors. Furthermore, about a quarter scored below the expected level for tertiary education (CEFR, C1 scale) in at least two sections of the language tests. The results of the Swedish tests and language skill assessments were correlated with academic performance in the first

year of the pharmacy programme, while admission grades were not.

These findings suggest that despite admission grades indicating adequate skills, students with poor Swedish proficiency test results struggled with oral and written communication limiting their ability to perform course tasks effectively. Although students with high academic performance and scores in both the Swedish test and the Swedish skill assessments were found in both the SFL and SAS groups, students with insufficient Swedish proficiency to effectively perform course tasks were overrepresented in the SAS group.

The correlation between language proficiency and academic performance is consistent with the findings from a study involving Singaporean students, which

also showed a relationship between language proficiency and academic success (Bo *et al*., 2022), with 70% of students initially not meeting the required language proficiency standards for admission. The similarities between these results might evolve from both contexts involving developed multilingual countries where many domestic university students do not share the same first language as the language used for teaching (Bo *et al*., 2022).

An equal proportion of students from both the SFL and SAS groups took the language test (~50%), and no significant correlation was found between taking the tests and the language assessments. However, the trend suggesting students with weak oral presentation skills might have chosen not to take the test indicates that those with the lowest Swedish language competency could be underrepresented in the test results. If this trend reflects a real correlation, it could introduce a bias potentially downplaying the link between test scores and academic performance.

In the Swedish test, students performed worse in the listening comprehension section compared to the reading comprehension section and the grammar and vocabulary section, although a significant difference was found between the SFL and SAS groups across all three sub-tests. This discrepancy in the outcomes could be due to procedural reasons such as reluctance to replay the recording compared to revisiting the written text. It is far from certain that the listening comprehension among the students is much lower than the other aspects of their Swedish language skills.

An appropriate approach must be developed to address the fact that approximately a quarter of the students in the pharmacy programme lacked the expected Swedish language proficiency. The current approach focuses on helping students identify the need to improve their Swedish skills through learning activities and providing language support. Current language-related support includes the diagnostic tests in Swedish (and English) used in this study, a few lectures in grammar and academic writing, and access to extracurricular Swedish learning activities and resources run by the university.

A well-structured tutoring approach in a U.S. pharmacy programme to improve study skills, metacognition, and active learning, was shown to help low-performing students improve exam scores (Dirks-Naylor *et al*., 2019). This approach could encompass the language domain.

Another option could be to create an introductory course that integrates language skills, as such content is effective at improving academic performance (Parkhurst, 2007)

When teachers in the course CEB230 discussed the text's language-related issues with the students, most students acknowledged their challenges. However, some students were quite surprised. A study in Australia reported a similar phenomenon where most students produced essays mirroring their self-reported skills, but a subset of students overestimated their abilities (Hasegawa, 2013).

The students lacking expected Swedish skills were overrepresented in the SAS group, as measured by both the Swedish proficiency test results and assessments of their oral presentations and written essays.

About two-thirds of students in Swedish pharmacy programmes are of foreign ancestry (Statistics Sweden (SCB), 2022), whereas far fewer have taken SAS courses. Thus, the likelihood that oral communication was assessed differently based on visual appearance is low. The course content and learning goals of the SFL and SAS courses differ, with SFL focusing more on literary history and personal development, while the SAS focuses on technical aspects of Swedish skills (Economou, 2013).

Despite the emphasis on technical aspects of the language in the SAS course, and its equivalent status within the Swedish education system, the current study found significant differences in language proficiency and academic performance between these two groups.

The study highlighted the correlation between pharmaceutical academic achievement and the type of upper secondary school Swedish courses taken, but not to be seen as an evaluation of the parallel systems of SAS and SFL. The design and purpose of SAS have been widely debated in Sweden (Hedman & Magnusson, 2018), with no clear consensus. Some argue SAS is vaguely defined and sub-optimally constructed (Sahlée, 2017). That the SAS group seems to have lower Swedish proficiency skills supports debates that SAS education may not have the same quality as SFL (Radosevic, 2023).

A survey of over 400 primary school heads in Sweden showed that in 53% of the sampled schools, only a quarter of the SAS teachers had university credits for teaching SAS and in 9% of the schools there was no qualified SAS teacher (Duregård, 2013). Only 27% of schools had teachers with SAS subject competence.

Despite SFL and SAS courses being legally equivalent, the availability of these two parallel systems may reduce the reliability of upper secondary school grades as a selection criterion for university admission, However, Swedish universities are not allowed to consider this factor.

As observed, some students from both the SAS and SFL groups achieved top results in the Swedish test,

Swedish assessments and academic performance. Thus, it would not be desirable to generally require a higher grade for SAS students. The problem, however, may be the reliability of upper secondary school grades.

In line with the result of the current study, SAS has previously been shown to have lower exam results in a study of Swedish pharmacology, nursing, dentistry, medical and biomedical analyst students (Carlsson *et al.*, 2020). However, the observed differences in academic performance among the SFL and SAS groups may be influenced by confounders not addressed in this study. SAS is often linked to students having a foreign background, which, in turn, is associated with socioeconomic factors (Andersson *et al.*, 2019) and there is a weak association between socioeconomic status and academic performance in higher education (Rodríguez-Hernández *et al.*, 2020).

The lack of correlation between upper secondary school grades in Swedish and measured linguistic competence supports the broad picture in Swedish mass media that grades are currently not a reliable indicator of knowledge (Westerholm & Boman, 2021; Bergling, 2021; SVT, 2023, 2024). In 2009, the Swedish National Agency for Education found that there were large differences between the Swedish language grades obtained in upper secondary school and the grades in the national exam. This difference was found to depend on which teacher the student had, although there were also large differences between schools (Swedish National Agency for Education, 2009).

A more recent report confirmed ongoing discrepancies in grade-setting between schools, although differences between teachers were not analysed in this report (Swedish National Agency for Education, 2020).

This flaw in the system is unfair to students who obtain a lower grade than those with the same skill who thereby miss out on access to desired education, and to students who believe they have the skills needed for tertiary education when they do not.

Furthermore, a report by Swedish government agencies showed that students from independently-run schools performed worse in their university studies than students from municipal-run schools (Swedish National Agency for Education & Swedish Higher Education Authority (UKÄ), 2024).

A potential discrepancy between upper secondary school grades and actual proficiency highlights potential confounders wherein students with insufficient Swedish proficiency might also lack other required skills, such as English which is also associated with academic performance (Bo *et al.*, 2022).

While all enrolled students have upper secondary school grades that demonstrate other required proficiencies, it was outside the scope of this article to assess skills beyond Swedish proficiency.

Interestingly, in the U.S., grade reliability is also a concern. Despite this limitation, a study reported that the upper-secondary school grade point average (GPA) is a five-time stronger predictor of college graduation than American college testing (ACT) scores (Allensworth & Clark, 2020). Similarly, in Sweden, GPA is a more reliable predictor of academic performance than the SweSAT scores, although these findings did not extend to highly competitive programmes (Karlsson & Wikström, 2022), and the pharmacy programme is moderately competitive requiring relatively high grades for admission (Carlsson *et al.*, 2020; Antagningsportalen, 2024). In competitive programmes, a ceiling effect may limit the reliability of GPA to predict students' academic performance in such programmes (Arslan & Benke, 2023).

Limitations

The reported findings are most relevant to programmes with a high proportion of students from foreign backgrounds, and those within the Swedish education system. However, these findings are also applicable to higher education programmes globally. Even so, that this cross-sectional study only assessed a single year of one Swedish pharmacy programme is limiting in terms of external validity, drawing non-contextual inferences requires caution. Another limitation is that only Swedish language proficiency was assessed, though proficiency in English, chemistry, and biology could be correlated with Swedish language skills and independently affect academic performance. Finally, in a cross-sectional study, no causality may be determined, only correlations.

Future implications

Future research should consider various avenues to address the identified limitations. Similar studies in other contexts such as pharmacy programmes in other countries are warranted., A more holistic approach covering other required skill proficiencies and socioeconomic domains is warranted to help understand how they might affect academic performance independently or in combination.

Further, internal validity could be enhanced by collecting prospective data over a longer timeframe, which could also be applied to the cohort reported in this study. In future studies involving a larger cohort, it would also be valuable to investigate the underlying causes of the poor Swedish proficiency observed in some students.

The present study revealed a link between the type of Swedish language course taken at upper secondary school, Swedish language proficiency and academic performance at the university-level pharmacy programme. The results suggest students in the SFL group performed better than those in the SAS group.

Although having Swedish as an additional language is a prerequisite for attending SAS upper secondary school courses, the focus should shift away from ethnic background. Society will become more inclusive and fairer by ensuring that all students, attain the required language proficiency for learning regardless of their first language.

Conclusion

Low achievement in students' Swedish language proficiency test results correlated with difficulties both in oral communication and writing ability, despite all students having admission grades that suggested adequate skills. The upper secondary school grades were not associated with Swedish test results, assessments of written and oral communication, or academic performance, however, Swedish test results correlated well with both assessments of Swedish written and oral communication, as well as academic performance. Versatile Swedish skills are not a concrete predictor for academic success, but insufficient Swedish language skills appear to impair chances for advancement. Educational institutions at all levels should promote equity by ensuring that the students attain adequate language proficiency as a requirement for further studies and successful careers which would be of immense benefit to society.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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References

Allensworth, E. M., & Clark, K. (2020). High school GPAs and ACT scores as predictors of college completion: Examining Assumptions About Consistency Across High Schools. *Educational Researcher*, **49**(3), 198–211. https://doi.org/10.3102/0013189X20902110

Andersson, K., Hansson, K., Rosqvist, I., Lyberg Ahlander, V., Sahlen, B., & Sandgren, O. (2019). The contribution of bilingualism, parental education, and school characteristics to performance on the clinical evaluation of language fundamentals: Fourth edition, Swedish (Brief Research Report). *Frontiers in Psychology*, **10**, 1586. https://doi.org/10.3389/fpsyg.2019.01586

Antagningsportalen. (2024). *Admission statistics for the Pharmacy program (2023)*. Retrieved July, 11 from https://www.antagningsportalen.se/goteborgs-universitet/apotekarprogrammet

Arslan, J., & Benke, K. (2023). Statistical analysis of ceiling and floor effects in medical trials. *Applied Biosciences*, **2**(4), 668–681. https://www.mdpi.com/2813-0464/2/4/42

Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society: Series B (Methodological)*, **57**(1), 289–300. https://doi.org/https://doi.org/10.1111/j.2517-6161.1995.tb02031.x

Bergling, M. (2021). *Review: 6 of 10 schools increased grades during the pandemic*. Skolvärlden. https://skolvarlden.se/artiklar/granskning-6-av-10-skolor-hojde-betygen-under-pandemin/

Bo, W. V., Fu, M., & Lim, W. Y. (2022). Revisiting English language proficiency and its impact on the academic performance of domestic university students in Singapore. *Language Testing*, **40**(1), 133–152. https://doi.org/10.1177/02655322211064629

Carlsson, T., Winder, M., Eriksson, A. L., & Wallerstedt, S. M. (2020). Student characteristics associated with passing the exam in undergraduate pharmacology courses: A cross-sectional study in six university degree programs. *Medical Science Educator*, **30**(3), 1137–1144. https://doi.org/10.1007/s40670-020-01026-8

Dirks-Naylor, A. J., Cook, C., & Nhean, P. (2019). Development and assessment of an academic performance enrichment program for low-performing, first-year pharmacy students. *Advances in Physiology Education*, **43**(3), 259–265. https://doi.org/10.1152/advan.00184.2018

du Prel, J. B., Röhrig, B., Hommel, G., & Blettner, M. (2010). Choosing statistical tests: Part 12 of a series on evaluation of scientific publications. *Deutsches Ärzteblatt International*,

107(19), 343–348.
https://doi.org/10.3238/arztebl.2010.0343

Duregård, M. L. (2013). *Substantial shortcomings in Swedish as a second language education*. Ämnesläraren. https://www.vilarare.se/amneslararen-svenska-sprak/svenska-som-andrasprak/stora-brister-i-undervisning-i-svenska-som-andrasprak/

Economou, C. (2013). Swedish and Swedish as a second language in the Gy11 syllabus - two equivalent subjects? *Preschool - Research on teaching and learning*, **11**(2013), 44–60. https://doi.org/10.61998/forskul.v1i11.27598

Edmark, K., & Persson, L. (2021). The impact of attending an independent upper secondary school: Evidence from Sweden using school ranking data [Article]. *Economics of Education Review*, **84**, Article 102148. https://doi.org/10.1016/j.econedurev.2021.102148

Hasegawa, H. (2013). Students' perceptions and performances in academic essay writing in higher education. *International Journal of Innovative Interdisciplinary Research*, **4**, 1–14. http://hdl.handle.net/20.500.11937/43313

Hedman, C., & Magnusson, U. (2018) Similar or similar opportunities? Discourses on the school subject Swedish as a second language within the academic field in Sweden. *Acta Didactica Norge*, **12**(1), Art. 7. https://doi.org/10.5617/adno.5569

IELTS. (1980). *IELTS*. https://ielts.org/about-ielts/

Karlsson, L., & Wikström, M. (2022). Admission groups and academic performance: A study of marginal entrants in the selection to higher education. *The B.E. Journal of Economic Analysis & Policy*, **22**(1), 155–191. https://doi.org/doi:10.1515/bejeap-2020-0434

Löwenadler, J. (2023). Trends in Swedish and English reading comprehension ability among Swedish adolescents: A study of SweSAT data 2012–2018. *Scandinavian Journal of Educational Research*, **67**(4), 591–606. https://doi.org/10.1080/00313831.2022.2042841

Martirosyan, N. M., Hwang, E., & Wanjohi, R. (2015). Impact of English proficiency on academic performance of international students. *Journal of International Students*, **5**(1), 60–71. https://doi.org/10.32674/jis.v5i1.443

Neumann, H., Padden, N., & McDonough, K. (2019). Beyond English language proficiency scores: Understanding the academic performance of international undergraduate students during the first year of study. *Higher Education Research & Development*, **38**(2), 324–338. https://doi.org/10.1080/07294360.2018.1522621

Oliver, R., Vanderford, S., & Grote, E. (2012). Evidence of English language proficiency and academic achievement of non-English-speaking background students. *Higher Education Research & Development*, **31**(4), 541–555. https://doi.org/10.1080/07294360.2011.653958

Parkhurst, C. (2007). A communication course for a linguistically diverse student population. *American Journal of Pharmaceutical Education*, **71**(2), 36. https://doi.org/10.5688/aj710236

Phakiti, A. P. (2008). Predicting NESB international postgraduate students' academic achievement: A structural equation modeling approach. *International Journal of Applied Educational Studies*, **3**(1), 18–39.

R Core Team. (2020). *R: A language and environment for statistical computing*. In R Foundation for Statistical Computing. https://www.R-project.org/

Radosevic, K. (2023). *The shortcomings in Swedish as a second language increase the language gap*. Göteborgs-Posten. https://www.gp.se/debatt/bristerna-i-svenska-som-andrasprak-okar-sprakklyftan.f6faf03d-d325-424b-94fc-f90866708136

Robinson, E. T., Cochrane, Z. R., Akiyode, O., Chahine, E. B., Culhane, J. M., Do, D. P., Franson, K. L., Minze, M. G., & Ross, L. J. (2023). Envisioning the future of student success: Report of the 2022–2023 AACP student affairs standing committee. *American Journal of Pharmaceutical Education*, **87**(8), 100559. https://doi.org/https://doi.org/10.1016/j.ajpe.2023.100559

Rodríguez-Hernández, C. F., Cascallar, E., & Kyndt, E. (2020). Socio-economic status and academic performance in higher education: A systematic review. *Educational Research Review*, **29**, 100305. https://doi.org/10.1016/j.edurev.2019.100305

Sahlée, A. (2017). *Swedish as a second language in school: On language use and conceptions of language*. [PhD dissertation, Department of Scandinavian Languages, Uppsala University]. Retrieved from DiVA. Uppsala. *https://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-317496.*

Statistics Sweden (SCB) (2022). *Swedish and foreign background among students and doctoral students in higher education 2020/21*. (UF 19 SM 2201). Retrieved from https://www.scb.se/publikation/45735

Statistics Sweden (SCB) (2023). *Higher education. Student completion and result at first and second cycle (Corrected 2024-01-30)*. (UF 20 SM 2303). Retrieved from https://www.scb.se/publikation/50259

SVT. (2023). New investigation to stop grade inflation - graduation exams could be introduced *SVT*. https://www.svt.se/nyheter/inrikes/ny-utredning-ska-stoppa-betygsinflation-examensprov-kan-inforas

SVT. (2024). The new minister for education about inflated grades: "Awful". *SVT*. https://www.svt.se/nyheter/inrikes/utbildningsministern-om-gladjebetygen-bedrovligt

Swedish Council for Higher Education (UHR). (2024). *Admission statistics for the pharmacy program in Gothenburg*. https://www.uhr.se/studier-och-antagning/antagningsstatistik/detaljsida/?utbildningId

Swedish Higher Education Authority (UKÄ) (2024). *To tertiary education from upper secondary school - the students' performance during the first study year (2023:468)*. Retrieved from https://www.skolverket.se/publikationer?id=12579

Swedish National Agency for Education. (2009). *Equitable grading in upper secondary school? An analysis of the relationship between national tests and course grades*

(SKOLV-R-338). Retrieved from
https://www.skolverket.se/publikationer?id=2286

Swedish National Agency for Education. (2020). *Analyses of equitable grading in upper secondary school (SKOLV-R-2020:3-SE)*. Retrieved from
https://www.skolverket.se/publikationsserier/rapporter/2020/analyser-av-likvardig-betygssattning-i-gymnasieskolan

Swedish National Agency for Education (2023). *PISA 2022*. Retrieved from
https://www.skolverket.se/publikationsserier/rapporter/2023/pisa-2022

Vandenbroucke, J. P., von Elm, E., Altman, D. G., Gøtzsche, P. C., Mulrow, C. D., Pocock, S. J., Poole, C., Schlesselman, J. J., & Egger, M. (2007). Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and Elaboration. *PLOS Medicine*, **4**(10), e297. https://doi.org/10.1371/journal.pmed.0040297

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the

Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *PLOS Medicine*, **4**(10), e296. https://doi.org/10.1371/journal.pmed.0040296

Westerholm, A., & Boman, A. (2021). The Swedish national agency for education: Time to discuss alternatives to todays grading system. *Skolvärlden*. https://skolvarlden.se/artiklar/skolverket-dags-att-diskutera-alternativ-till-dagens-betygssystem

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T., Miller, E., Bache, S., Müller, K., Ooms, J., Robinson, D., Seidel, D., Spinu, V., & Yutani, H. (2019). Welcome to the Tidyverse. *Journal of Open Source Software*, **4**(43), 1686. https://doi.org/10.21105/joss.01686

Yeritsyan, A., Mjelde, J. W., & Litzenberg, K. K. (2022). Grade inflation or grade increase. *Journal of Agricultural and Applied Economics*, **54**(2), 375–393. https://doi.org/10.1017/aae.2022.15