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Pedagogical challenges in nurse education - a case study focusing on the completion rate in theoretical education at a Swedish University

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Abstract

Background: The purpose of this survey was to relate completion rate and results on national clinical final examinations to student's admission background and examination results for nursing and medical courses.

Methods: The research data were based on a quantitative case study, with 286 nursing students, using statistical analysis.

Results: The programme's overall completion rate was 76%, i.e. almost one out of four students did not complete the programme. The higher students' upper secondary/high school grades, the fewer attempts they needed to pass the nursing and medical courses exams ($p < 0.001$). The average examination attempts needed to pass courses in medical science was significantly greater than the number needed to pass courses in nursing science ($p < 0.001$). In a multivariate analysis both upper secondary/high school grades and average examination attempts needed to pass were significant predictors for national clinical final examination score.

Conclusions: In sum, upper secondary/high school grades and examination attempts needed, especially for courses in medical science, may be regarded as important indicators of achieved knowledge and skills which are tested in the national final examination.

Keywords: Case study; Education; Nurse student; Pedagogy; Statistical analysis; Work integrated learning

Introduction

Demand for nurses in Sweden is strong, making it crucial that nursing students are provided the best possible conditions for completing their education, irrespective of background and experience. National and local education aims require that graduated nurses attain a level of skills appropriate for current and future healthcare needs (SFS 2006; Socialstyrelsen 2005). In order to ensure that a student in a nursing education programme reach such clinical competence it is essential to study potential predictors for successful completion. The objective with this study is to relate completion rate and results on national clinical final examination tests to student's admission background and examination results for nursing and medical courses.

Background

Swedish nurse education has undergone several changes due to developments in society and in healthcare services. In the 1950s-60s, nurses were expected to possess technical and scientific knowledge; in the 1980s, their knowledge was expected to be based on nursing science and a holistic view of the individual (Furåker 2001).

Since 1993, the nursing education programme is a three-year higher education programme, providing a professional qualification and a Bachelor's degree in nursing (SFS 2013). At the same time, the nursing education programme admission criteria changed: students were no longer required to have previous nursing experience to apply for admission (Furåker 2001).

With the academisation of nursing education programmes, the nursing subject, in both Sweden and in Europe, has received an increasingly important role and is expected to present a clear structure with a theoretical base and progression (Laiho 2010; SSF 2010). Additionally, nursing courses are expected to integrate closely with other support subjects such as ethics, biomedicine, public health and pedagogics (SSF 2010). A review of the curricula of nursing education programmes reveals that medical science is the most common support subject for nursing science. The scope of the medical subject, in relation to nursing, varied from 30 to 67.5 of the nursing education programme's overall 180 university credits (Ohlén et al. 2011). Previous research (Lilja Andersson 2007) has found that nursing students express concerns about the content of the two subjects nursing science and medical science. Students initially felt that the medical subject was presented in a fragmentary manner and was difficult to combine with understanding of the functions and illnesses of the human body. The medical subject felt abstract and was difficult to discuss as it seemed to be merely a mass of details to be memorised. The nursing subject was also, initially and sometimes during the education, perceived as being diffuse and abstract with a dissonance between the factual knowledge and the underlying philosophical assumptions.

Since 2007, 16 of Sweden's 25 nursing education programmes have been using the Swedish National Clinical Final Examination (NCFE). The purpose of this examination is to test whether the student has achieved the clinical competence expected of newly graduated nurses as per university and The National Board of Health and Welfare regulations (SFS 2006; Socialstyrelsen 2005). The NCFE comprises a practical and a theoretical individual examination carried out during the nursing education programme's last term (www.nkse.se). In the theoretical part, the student is expected to describe and explain own actions based on a patient case, thus showing ability to integrate the theoretical and practical knowledge gained during the nursing education programme. Students highlighted that the NCFE gave them greater confidence and awareness of their clinical competence (Lilja Andersson et al. 2013).

To be accepted as a student at a Swedish nursing education programme a candidate must have achieved complete and passing upper secondary/high school (a three-year curriculum) grades, including higher level English, mathematics, civics/social studies and natural sciences. This qualification can be achieved either through an upper secondary/high school programme (offering theoretical and more vocational programmes), directly following elementary/grade school, or through a folk high school programme. Alternatively, candidates can sit the Swedish Scholastic Aptitude Test, which may qualify for admission. Candidates for the nursing education programme are ranked according to

their upper secondary/high school grades or their Swedish Scholastic Aptitude Test score (www.sjuksköterska.nu; www.studera.nu).

In this study the nursing education programme at a Swedish university is studied. The programme's main subject, nursing science, is characterised by its holistic view of man and a scientific and ethical approach. Medical science is a support subject of nursing science and covers anatomy, physiology, illness and the treatment thereof. The nursing subject represents 135 of the programme's 180 university credits, with the medical subject representing the remaining 45 credits.

When it comes to the knowledge production and learning objectives in the programme both theoretical and practical knowledge is emphasised. Theoretical knowledge gained through formal learning is many times expressed as theories of general validity, while practical knowledge developed through informal learning constitutes a basis for being able to act in specific situations. In nurse education, there is often a tension between the ambitions to integrate theoretical knowledge with practical knowledge, and one challenge for nurse education is to elaborate a way to satisfy educational needs, workplace needs and, above all, students' needs (Newton et al. 2009).

As nursing education programmes at Swedish universities receive government funding in accordance with the number of students who pass the national clinical final examination and complete the entire nursing education programme, it is of course desirable for universities to keep the dropout rate as low as possible and to achieve the highest possible results in terms of clinical competence, programme completion, and national clinical final examination scores. Naturally, students share this ambition, as they do not want to invest time and effort into the programme without reaching completion.

In order to understand and optimise the learning and educational environment, it is essential to collect and analyse data about learners and context, i.e. to use learning analytics (Long and Siemens 2011). Since Swedish nurse education has undergone substantial changes in terms of content and admission criteria, this study is focusing on how these factors may relate to completion rate and results on the national examination. The objectives of the study are:

1. To study potential relationships between completion rate and student's admission background and examination results for nursing and medical courses.
2. To study potential relationships between results at the national clinical final examination and student's admission background and examination results for nursing and medical courses.

Method

Study population

The study comprised three nursing education programme admission classes with a total of 293 students starting in the spring and autumn of 2008 and the spring of 2009 respectively at a university in Sweden. Of the 293 students, 7 were excluded due to absence of examination results, so the study population comprised 286 students. Most of the study population's 286 students were women ($n = 261$, 91.3%). The population was aged (at the beginning of the programme) 19 to 51 years and the average age was 26.6 years (7.3, Median = 24.0). The study population ($n = 286$) comprised 144 (50.35%)

students admitted based on upper secondary/high school grades, which can range from 0.97 to 22.50 and in this group ranged from 13.04 to 20.00, 135 (47.20%) students admitted based on Swedish Scholastic Aptitude Test points, which can range from 0.1 to 2.0 and in this group ranged from 1.0 to 1.7, including 25 admitted based on Swedish Scholastic Aptitude Test points with work experience (0.2-1.9), and 5 (1.75%) students admitted based on folk high school credits (3–4) (Table 1). There was no information regarding the qualifying education of 2 (0.07%) students, as they were originally admitted to a nursing education programme at another university and subsequently transferred to the current university. Out of the study population's 286 students 72 (25%) had been admitted from vocational upper secondary/high school education (nurse auxiliary, electrical, hair dressing and technical programmes). Out of these 72 students 56 (20% of the study population) had completed an upper secondary/high school nurse auxiliary programme. Sixty percent of the study population had been admitted from theoretical upper secondary/high school education (economic, natural science, social science and technical programmes). There was no information regarding the qualifying upper secondary/high school education of the remaining 15% of the students.

Data and data collection

The data comprised the examination results from all theoretical nursing and medical science courses. The nursing science courses changed slightly for the three admission classes in the course of the nursing education programme, whereas the medical science courses remained unchanged throughout the studied period. The students' examination results during the programme were compared with their results on the NCFE at the end of the programme.

Data collection was done during the 2012 spring term from the Swedish higher education study administration system and from the admissions board. This system stores data on the individual student's sex, age, qualifying upper secondary/high school education, examination attempts and examination results. Swedish Scholastic Aptitude Test points were only available for students admitted based on said points with or without working experience. Likewise, the upper secondary/high school grades were only available for students in the upper secondary/high school admission group. Information about the number of examination attempts needed to pass a course was collected for each individual course. Moreover, the number of examination attempts needed to pass was calculated for each individual student on an aggregated level. For each year, and for each student, the average number of examination attempts needed to pass was calculated for the group of courses in nursing and medical science separately. For

Table 1 Admission qualifying education and admission points for the study population (n = 286, missing information for 2 students)

	Upper secondary/ high school credits	Scholastic aptitude test points	Scholastic aptitude test points with work experience	Folk high school credits
Number (%) (max-min)	n = 144 (50.35%) (0.97-22.50)	n = 110 (38.46%) (0.10-2.00)	n = 25 (8.74%) (0.10-2.00)	n = 5 (1.75%) (1-4)
Average	15.67	0.69	1.05	3.40
Median (SD)	15.31 (1.75)	0.70 (0.40)	1.20 (0.42)	3.00 (0.54)

instance, if a student has a value of 1.2 for nursing courses in Year 2, that student had to make on average 1.2 attempts for the completed nursing courses in Year 2. For each student the average examination attempts needed to pass per year and the overall average examination attempts needed to pass, including all courses passed, were also calculated. For instance, if a student has 1.5 in average overall examination attempts needed to pass, it means that the student had to make on average 1.5 attempts to complete the courses. Qualifying education information (grades/points) was obtained from the admissions board. Admission was granted based on either of the following criteria: upper secondary/high school grades; Swedish Scholastic Aptitude Test points; Swedish Scholastic Aptitude Test points with work experience; and folk high school credits (1–4). Admission distribution over these categories and descriptive statistics for grades and Swedish Scholastic Aptitude Test points are given in Table 1.

The upper secondary/high school grades did not differ significantly between males and females (average 16.3 vs 15.6, $p > 0.20$), and there was no significant correlation between upper secondary/high school grades and age ($r = 0.1$, $p > 0.20$). The upper secondary/high school grades did not differ significantly between the different upper secondary/high school grades groups (nurse auxiliary group: average 15.8, vocational but not nursing group: average 15.2, theoretical group: 15.9, $p > 0.20$). There was no significant difference in Swedish Scholastic Aptitude Test points between males and females (average 0.62 vs average 0.70, $p > 0.20$) and there was no significant correlation between age and said points ($r = 0.2$, $p = 0.11$). The Swedish Scholastic Aptitude Test points did not differ significantly between the different upper secondary/high school grades groups (nurse auxiliary group: average 0.6, vocational but not nursing group: average 0.5, theoretical group: 0.7, $p = 0.13$).

Data privacy and ethical considerations

Data was coded and personal information was treated confidentially. Only those responsible for the study had access to data and personal information. Coded data and personal information were stored separately. During the analysis data was de-identified, i.e. names and civic registration numbers were removed. The results have been presented in such a manner that individuals cannot be identified (Vetenskapsrådet 2002). This study was approved by the University West Ethics Committee.

Data analysis

For analysing relationships between categorised data, the classical chi-square test was used. For comparing two or more groups for continuous data, standard t-test or ANOVA was used. However, in the case of small samples and skewed distribution, the Mann–Whitney-U's test or Kruskal-Wallis test was used instead. When analysing differences between courses (nursing vs medical science) comparisons of examination attempts needed to pass were analysed for each student by applying Wilcoxon's signed-rank test. When analysing the potential relationship between continuous variables Pearson (r) or Spearman (r_s) correlation was used dependent on distribution shape. When studying relationships between the national test result and potential predictors, the significant predictors found in the bivariate analyses may be inter-correlated. In order to study the significant variables simultaneously a multiple regression model was adopted, including all explanatory variables that were significant in the bivariate analyses. The variance

inflation factor was used to diagnose potential problems with multicollinearity. Generally, a significance level was set to 5%. Due to the fact that the study is of an exploratory nature and that many tests were performed, significances should be interpreted with care and regarded as interesting findings rather than as conclusive evidence (Altman 1991). IBM software SPSS 20.0 was used for all analyses.

Results

Completion rate

Out of the study population's 286 students, 218 (76%) had completed their education at the time of the study in the spring of 2012. The remaining students ($n = 68$, 24%) had not at the time of data collection completed their education due to either failing examinations or changing study location. The students (85%) who had achieved their degree completed their studies within the nursing education programme's time frame (3 years).

The difference in completion rate between male and female students (84% vs 76%) was not significant ($p > 0.20$). The proportion of completers among students admitted based on upper secondary/high school grades was 75%, which did not significantly differ from the 79% completion rate found in the group of students admitted based on Swedish Scholastic Aptitude Test points ($p > 0.20$). The completion rate among students admitted based on folk high school credits was as low as 40%, but this group consisted of only five students, not allowing for significance testing. The two students who had transferred from another university completed the programme. The completion rate did not differ significantly between the different upper secondary/high school education groups ($p > 0.20$). Table 2 offers an overview of the completion rate, by gender, admission group and upper secondary/high school education group. The completers were on average 0.5 years younger than the non-completers, a difference which was not significant ($p > 0.20$).

Within the group admitted based on upper secondary/high school grades, there was a significant difference in upper secondary/high school grades, as the median was 15.5 among completers and 14.8 among non-completers ($p = 0.031$). However, in the group admitted based on Swedish Scholastic Aptitude Test points, there was no significant difference between non-completers and completers (the mean was 0.72 and 0.76, respectively, $p > 0.20$).

Table 2 Proportion completers, by gender, admission group and upper secondary/high school education

Variable	Categories	n	Proportion completers	p-value (chi-square)
Gender	M	25	84%	>0.20
	F	261	76%	
Admission group (excluding FHS and transferred)	USHS	144	75%	>0.20
	SAT	135	79%	
USHS education group	Nurse auxiliary	56	84%	>0.20
	Vocational but not nursing	16	88%	
	Theoretical	172	76%	

USHS - upper secondary/high school.

SAT - Swedish Scholastic Aptitude Test.

FHS - folk high school.

In Year 1, the completion rate was 263 out of the 286 admitted students (92%). Among the 23 Year 1 non-completers 20 failed at least one nursing course and 20 failed the medical course. Among the 263 first year completers 249 managed to complete Year 2. Thus, the risk of not completing Year 2 among the Year 1 completers was 5%. Among the 14 non-completers Year 2, 10 had failed at least one nursing course, and 10 had failed at least one medical course. Among the 249 who completed Year 1 and Year 2, 31 (12%) did not complete Year 3. Among these non-completers all had failed at least one course and 21 had not completed their student thesis.

Examination attempts needed – differences between courses

The number of examination attempts needed to pass a course varied in the range 1.0-1.9. The courses drug calculations I and II both had an average of 1.9 examination attempts needed to pass. During all three years of the educational programme, the average examination attempts needed to pass in medical science was significantly greater than the number needed to pass nursing science courses. In Year 1 the course in medical science demanded on average 0.4 more attempts than the average number needed to pass a nursing science course, in Year 2 and Year 3 the corresponding figure was 0.3 and 0.2, all p-values < 0.001, see Table 3.

Examination attempts needed - differences between students

The overall average number of examination attempts needed to pass varied from 1.0 to 2.2, with a mean of 1.3 (median 1.2, st.dev 0.3). The mean was 1.3 for both males and females. There were no significant differences between admission groups, neither between different upper secondary/high school groups. There was no significant correlation to age. There were, however, significant correlations between the overall average examination attempts needed to pass and upper secondary/high school grades ($r_s = -0.4$, $p < 0.001$) and Swedish Scholastic Aptitude Test points ($r_s = -0.4$, $p < 0.001$), indicating a decreasing number of attempts needed with increasing upper secondary/high school grades and Swedish Scholastic Aptitude Test points. The overall average number of attempts needed was 1.2 among students who completed the programme, as compared with 1.4 among non-completers ($p < 0.001$).

National Clinical Final Examination

To pass the National Clinical Final Examination (NCFE) students had to score at least 33 of 50 possible points. Of the study population's 286 students 219 (76.6%) attempted the NCFE of which 20 (9.1%) failed the examination. The average score was 36.2 points (SD 4.0). Among the 68 students without a complete nursing education programme 13 attempted the NCFE of which 9 passed (69%). The proportion of approved tests among the completers was significantly higher (92%, 190 out of 206), $p = 0.005$. There was no

Table 3 Number of attempts needed to pass a course, nursing vs medical science

Year	Average number of attempts needed to pass courses in		p-value (Wilcoxon)
	Nursing science mean (median)	Medical science	
1	1.2 (1.2)	1.6 (1.0)	<0.001
2	1.2 (1.0)	1.5 (1.4)	<0.001
3	1.0 (1.0)	1.2 (1.0)	<0.001

significant difference in average NCFE score between males and females, and no significant correlation between NCFE score and age. There were no significant differences in NCFE score between admission groups, or between different upper secondary/high school groups. There was a significant correlation between upper secondary/high school grades and NCFE score ($r = 0.3$, $p < 0.001$), but not between Swedish Scholastic Aptitude Test points and NCFE score ($r = 0.0$, $p > 0.20$).

There was a significant correlation between overall number of examination attempts needed to pass and NCFE score ($r_s = -0.4$, $p < 0.001$) and there are a number of significant correlations between NCFE score and examination attempts needed to pass divided by year and by type of courses (nurses vs medical science), see Table 4. The highest correlations are between average examination attempts needed to pass courses in nursing science Year 1 and NCFE score ($r_s = -0.3$, $p < 0.001$) and between average examination attempts needed to pass courses in medical science in Year 2 and NCFE score ($r_s = -0.4$, $p < 0.001$). In an exploratory manner, we also analysed correlations between examination attempts needed to pass each individual course and NCFE and found a number of significant correlations. The courses with a correlation of a magnitude equal to or above 0.3 were: Fundamental Principles of Caring, the Concepts of Nursing and Theory of Sciences II ($r_s = -0.4$, $p < 0.001$), Clinical Medicine in Physical Ill-Health ($r_s = -0.4$, $p < 0.001$) and Drug Calculation I and II ($r_s = -0.3$, $p < 0.001$ for both courses). Thus, there is a correlation between NCFE score and examination attempts needed to pass both individual courses and aggregated levels as well. The negative correlations indicate that the NCFE score increases when the number of examination attempts needed to pass decreases.

In sum, the NCFE score was significantly related to: completion, upper secondary/high school grades and examination attempts needed to pass, see Table 5. However, according to analyses presented in previous parts, we know that completion was related to both upper secondary/high school grades and examination attempts needed to pass, and that examination attempts needed to pass was significantly correlated to upper secondary/high school grades. Thus, the factors that were found to be significantly related to NCFE in the bivariate analyses were also inter-related. To be able to study these potential predictors simultaneously a multiple regression model was adopted. The model included: completion, upper secondary/high school grades and overall examination attempts needed to pass. There was no difference between completers and non-completers, but both upper secondary/high school grades and overall examination attempts needed to pass remained significant ($p = 0.025$ and $p = 0.001$ respectively) in this model. The collinearity diagnostic showed low variance influencing factors (range 1.0-1.2) indicating no multicollinearity. The model estimated the difference between completers and non-completers to 1.6 ($p > 0.20$), the slope for upper secondary/high school grades

Table 4 Correlation (r_s) between NCFE score and the average number of attempts needed to pass courses in nursing/medical science and total per year

Year	Courses in		
	Nursing science	Medical science	All courses
1	-0.3 ($p < 0.001$)	-0.2 ($p = 0.002$)	-0.3 ($p < 0.001$)
2	-0.1 ($p > 0.20$)	-0.4 ($p < 0.001$)	-0.4 ($p < 0.001$)
3	-0.2 ($p = 0.023$)	-0.2 ($p = 0.006$)	-0.2 ($p = 0.013$)

Table 5 Results from multiple regression, with NCFE score as independent variable and completion, upper/secondary high school grades and average examination attempts needed to pass as explanatory variables

Model summary (n = 108)			
F-test (df = 3,105)	F = 9,3 (p < 0.001)		
R-Square	0.21		
Parameter estimates			
Explanatory variable	Coefficient	S.E.	p-value
Constant	36.3	5.5	<0.001
Completer vs non-completer	-1.6	1.5	>0.20
Upper/secondary high school grades	0.6	0.3	0.025
Examination attempts needed to pass	-5.9	1.7	0.001

was 0.6 ($p = 0.025$), i.e. an increase of one upper secondary/high school grade unit corresponds to 0.6 more units in NFCE score and finally the slope for examination attempts needed to pass was -5.9 ($p = 0.001$) indicating a decrease of 5.9 NFCE points if the examination attempts needed to pass increases with one unit. Thus, a change of one unit in upper secondary/high school grades implies roughly the same effect on NFCE scores as a change of 0.1 units in overall examination attempts needed to pass.

In an exploratory manner, we also replaced overall examination attempts needed to pass with examination attempts needed to pass by year and type of course and found that the original bivariate analyses were stable, significant correlations between examination attempts needed to pass and NFCE score remained.

Discussion

Completion rate

The overall completion rate for the nursing education programme was 76%, i.e. almost one out of four students did not complete the programme. Figures from the Swedish National Agency for Higher Education (2009) show that about one fourth of those failing to achieve their degree within a nursing education programme changed their place of study. Previous studies have shown that several factors can affect the study situation negatively and lead to defection, e.g. stress in the course of the programme (Timmins et al. 2011), stress in relation to examinations and assessments in the programme's practical and theoretical courses (Howard 2001), high work load, many study hours and too little leisure time (Pryjmachuk and Richards 2007; Watson et al. 2009) and difficulties in bridging the gap between the programme's contents and the expectations of the healthcare organisation (Duchscher 2009). In our data the dropout rate Year 1 was 8%. Among the remaining students who completed Year 1 and continued 5% dropped out Year 2. As mentioned above, some of the dropouts the first two years may be students changing study location. However, among students who managed to complete the first two years, the dropout rate in Year 3 was 12%. All of these dropouts had completed at least one course and a majority had attempted other courses. Thus, the explanation for non-completion the last year may be due to the other reasons described above. Two out of three of the non-completers Year 3 had not completed the student thesis.

Regarding background variables at admission, neither gender, age, Swedish Scholastic Aptitude Test points, admission group, nor upper secondary/high school education

group (nursing, other vocational or theoretical) were significantly related to completion. However, there was a difference in upper secondary/high school grades between completers and non-completers. It has previously been claimed that upper secondary/high school grades is one of the best admission criteria (Wedman 2000). However, the difference between the completers vs non-completers was only 0.7 and the standard deviation for upper secondary/high school grades was 1.6, indicating a large overlap in upper secondary/high school grades between completers and non-completers. Thus, upper secondary/high school grades may not be that predictive, at least not on an individual level.

Number of examination attempts needed to pass

The average number of examination attempts needed to pass was used for studying differences between students and between courses.

Regarding differences between groups of students we did not find any significant relationships between examination attempts needed to pass and admission group, upper secondary/high school education, gender or age. However, the upper secondary/high school credit and the Swedish Scholastic Aptitude Test point were both significantly related to the average examination attempts needed to pass, showing that an increase in upper secondary/high school grades/Swedish Scholastic Aptitude Test points goes hand in hand with a decrease in examination attempts needed to pass. In other words, students with higher grades/points at admission do not as many examination attempts as students with lower grades/points. The magnitude of the correlations ($r_s = -0.4$) could be classified as moderate (Cohen 1992). Regarding differences between courses we found a difference between courses in medical science compared to courses in nursing science. Medical courses demanded on average 0.4 more attempts to pass. As a comparison, the difference between non-completers and completers was 0.2 in overall average examination attempts needed to pass. Thus, the difference between medical and nursing science courses is twice as high.

National Clinical Final Examination

Out of the 219 students who attempted the National Clinical Final Examination (NCFE), 20 (9.1%) failed. Regarding the second objective of the study, i.e. to investigate explanatory factors possibly related to NCFE scores, the pattern was consistent with the pattern for completion rate. Among the background variables at admission, neither gender, age, Swedish Scholastic Aptitude Test points, admission group, nor upper secondary/high school education group (nursing, other vocational or theoretical), were significantly related to NCFE score. However, upper secondary/high school grades were moderately ($r_s = 0.3$) correlated to NCFE score. The information received successively during the nursing education programme was found to give valuable added information. We found that the average number of examination attempts needed to pass was correlated to NCFE score both on an aggregated level, e.g. by year, but also for some specific courses, i.e. one general nursing course and three medical courses (Clinical Medicine in Physical Ill-Health and Drug Calculations I and II). Several of these correlations reached a magnitude of 0.4 which may be regarded as a moderate magnitude, and jointly these factors may give valuable information for predicting NCFE score. There were some inter-correlations, e.g. between upper secondary/high school grades

and average examination attempts needed to pass, but in a multivariate analysis both upper secondary/high school grades and average examination attempts needed to pass remained significant. Furthermore, the variance inflation factors were low, which indicates that there were no problems with multicollinearity. Thus, each of these factors contains information related to NFCE which is not explained by the other factor. To investigate which factors that could contribute with valuable information in a model, and if that model could predict NCFE score with a useful precision, is an important continuation of this study, and results from such research will be presented in a forthcoming article.

Implications for educators

Results from studies like this one may be used for organisational purposes, e.g. for planning and resource management. For instance, resources for extra examination could be allocated for some courses. For faculty, results of this kind, together with our sources of information and practical experience from running the programme, may contribute to the evolution of the nursing education programme and pedagogical discussions.

In this study it is clear, in terms of examination attempts needed, that there is a difference between medical and nursing science courses. Medical science courses are generally more demanding for students. In a report from the Swedish National Agency for Higher Education (2009), both students and educators speak of the programme's varying demand levels between medical and nursing science courses, in terms of both work required and intellectual challenge. As teachers, we have experience of nursing students describing medical science courses as being more abstract, demanding and time consuming.

However, the clear differences in terms of challenges between the medical science and nursing science subjects indicate the relative importance of the nursing and medical science subjects in terms of promoting the nursing education programme's completion rate. This difference may be due to students lacking the necessary problem-solving abilities and medical knowledge, contributing to a shortfall in nursing knowledge and understanding. Another explanation may be that the students are not provided an opportunity to understand how the presented knowledge should be processed and understood in relation to clinical situations.

Ordinarily, medical science courses take the form of lectures providing a mass of factual knowledge about the human body, illnesses, diagnoses and treatments in a short time. However, Lilja Andersson (2007) and Benner et al. (2010) indicate that the actual learning effect of such teaching is often relatively modest. For the student, lecture form teaching can lead to overload and fragmentation (Benner et al. 2010) and does not contribute to the deep understanding required for true learning (Ramsden 2003), as new knowledge needs to be processed, analysed and practiced to have a lasting effect. Interest for and deep understanding of lecture content would be promoted were students to feel that the content is applicable (transfer of knowledge) and meaningful in the context of the programme's clinical practice periods (Marton and Booth 1997). Furthermore, other factors may influence how students absorb and develop the knowledge provided within the programme, such as intellect, study habits, work effort required and motivation (Marton and Booth 1997). Benner et al. (2010) claim that the most effective teaching is achieved "through integrating all three professional apprenticeships,

the knowledgebase, skilled know-how, and clinical reasoning and ethical components, in all teaching and learning settings” (pp. 80). Furthermore, they believe that the programme’s content should “[s]hift from a focus on covering decontextualized knowledge to an emphasis on teaching for sense of salience, situated cognition, and action in particular situations” (pp. 82). This means that a shift from teaching to learning and distributed knowledge is necessary. Students need to understand what is most important in the clinical situation (situated learning). Without such understanding students find it difficult to sort and prioritise the mass of knowledge received, and fail to understand how the knowledge can be used in clinical situations.

The result shows that a number of courses, e.g. Drug Calculation, have a significant correlation with the ability to pass the NCFE. Drug Calculation is crucial knowledge for every nurse for the sake of delivering exact volumes, in the correct manner, at the right time. For this reason, a barrier rule forces nurse students to suspend participation in further courses until the Drug Calculation courses have been passed. New NCFE regulations will demand 100% correct answers, thus making drug calculation even more important for completing the nursing education programme in future. This confirms the special importance for students of focusing on drug calculation in the nursing education programme in order to achieve their nurse degree and to increase the programme’s completion rate (NMC 2010). Wright (2012) and Hunter Revell et al. (2012) show that the programme’s content must allow nurse students to develop their drug calculation abilities in the context of clinical practice. Consequently, these findings underline the importance of having educators with advanced pedagogical skills and experience in order to meet the students’ need for support.

An important task for educators is to balance, integrate and optimise courses in both nursing and medical science in order to accomplish a holistic competence. One way to achieve this may be to focus on the strengths of the subjects’ approaches and explore how they can benefit from each other. Medical science course lectures should integrate more practical process-oriented learning and nursing science courses should integrate more theoretical knowledge applicable in the context of clinical practice periods.

This task is a challenge for nurse educators and calls for an approach in which theoretical knowledge and professional values are integrated with practical knowledge and clinical competence, thus providing an example of Work Integrated Learning (WIL). WIL is both a way to organise vocational education and a strategy to give it specific content (Patrick et al. 2008). WIL can serve as a pedagogical design to strengthen the nurse students’ progress towards understanding the professional skills (Jonsson et al. 2014).

Limitations

The study covered the nursing and medical science examination results of 286 students within the framework of the nursing education programme at a Swedish university. Transferability of the study’s results and conclusions may be limited by the study population’s size and/or by the fact that all data came from a single university. The limited sample size may have affected the power, i.e. increased the risk of type-II error in some of the comparisons. For instance, there were not that many male students, which gives low power to analyse in terms of gender.

Conclusion

We conclude that grades in upper secondary/high school are related to performance in courses and results at the National Clinical Final Examination. A student with higher grades is more likely to complete courses with fewer examination attempts needed, to complete the educational programme and to pass the NCFE. Disregarding high school grades, the number of examination attempts for courses in general, and for some courses in particular, are related to performance on the NCFE. We also found that medical science courses demanded substantially more attempts to pass examinations than nursing science courses. These findings indicate pedagogical challenges for educators.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

ME, MG, MSN, IB, KJ, and SP have made substantial contributions to design, acquisition of data, analysis, and interpretation of data and involved in drafting the manuscript. All authors read and approved the final manuscript.

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