Student assistants contribute to learning in anatomy, physiology and biochemistry

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Summary

Background: The study examines nursing students' experiences with Peer Assisted Learning (PAL) in anatomy, physiology and biochemistry (APB). Many nursing students find APB a challenge, and the failure rate in this subject is higher than in others. In order to address the challenges, our study institution offered a supplementary learning method in the form of Peer Assisted Learning (PAL). PAL is understood here as students learning from student assistants in their role as *peer teachers*. PAL is a student-active learning method that helps engage students in learning, teaching and supervision.

Objective: We wanted to gain knowledge about the students' experiences with PAL in APB.

Method: This study, which is part of a cross-sectional study, analyses thematic free-text responses to two of six open-ended questions from a structured questionnaire, which was completed anonymously via the learning platform Fronter. The questionnaire consisted of 38 questions (32 quantitative and 6 with free-text responses). Of the 175 first-year students studying for a bachelor's degree in nursing, 108 (62 per cent) participated in the study. Nineteen (17.6 per cent) of these responded that they had availed themselves of the student assistant programme, and all 19 answered the question about their experiences with PAL. This study examines the responses of these 19 students. In addition, we present quantitative data on the examination results for the students who did not use student assistants and for the 19 who did.

Results: The student assistants contributed to a better understanding of the subject content and inspired learning. The students had good learning outcomes and valued the sense of security they felt from being part of a smaller group.

Conclusion: Student assistants can contribute to student-active learning methods and can enhance the quality of education. Student assistants may help improve exam results, but there is not enough data to draw this conclusion. Further research is needed.

Many nursing students find anatomy, physiology and biochemistry (APB) a challenge. There is therefore a need to improve the quality of didactics in APB. This quality improvement is in line with the Ministry of Education and Research's guidelines in Report to the Storting No. 16 (2016–2017), Quality Culture in Higher Education: 'Higher education institutions must offer updated and relevant study programmes that encourage learning and completion' (1, p. 11).

One of the goals of quality improvement in higher education is to ensure that students experience optimal learning outcomes and personal development, and that a focus is placed on the need for more student-active learning forms (1). Higher education institutions have an international commitment through the 2015 Bologna Process to provide student-centred learning and teaching (2).

The requirement for more student-active learning methods and quality improvements in learning in higher education can be met by greater involvement of students as partners in the learning and teaching (3).

The Peer Assisted Learning method

Peer Assisted Learning (PAL) is an example of a learning method that activates students. Since the 1990s, the method has been highly valued in the UK, where it has been implemented in many educational institutions. The term PAL is broad, but the general understanding of the term is as follows: 'The emphasis in PAL is on active discussion and cooperative learning within the framework of a partnership with the formal structures of the course' (4, p. 1).

PAL focuses on students taking an active part in and responsibility for their own learning. PAL creates an environment for students to work together through discussions on subject matter and exam preparation (5). Black and MacKenzie (6) distinguish between *horizontal* and *vertical peer support*.
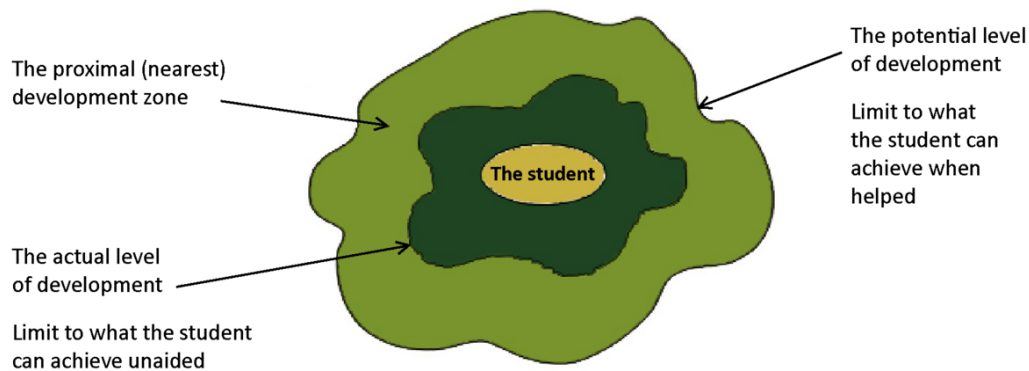
Horizontal peer support takes place among students at the same level, while *vertical peer support* is when students at a more advanced stage in their education support students in the lower years. The terms *student assistant* and *learning assistant* are used in Norwegian educational institutions in connection with this form of PAL. In international literature, the terms *peer teacher* and *tutor* (7) are used. This article mainly uses the term *student assistants*.

Theoretical basis

The PAL method is based on a social constructivist understanding of learning, inspired by Vygotsky. The theory is based on the notion that people generate and construct their own knowledge in interpersonal collaboration through language and interaction.

Vygotsky focused on helping the students in the zone of proximal development. This zone is the distance between the student's actual level of development – where independent problem solving is mastered – and the student's potential level of development – where problem solving can only be mastered through teacher guidance or in collaboration with more competent fellow students (8) (Figure 1).

Figure 1. The proximal development zone

The proximal (nearest) development zone

The actual level of development

Limit to what the student can achieve unaided

The student

The potential level of development

Limit to what the student can achieve when helped

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Modified in line with Imsen (2008: 259)

Bruner further developed Vygotsky's theory and described people as '*scaffolding*' for each other. By talking together and supporting each other, students can become more competent than if they had worked alone (10).

Bandura emphasises learning in a social community (social-cognitive learning theory) (11) and supports the importance of the positive effect of PAL, as does Wenger through the concept of *communities of practice* (12). The student assistants in our study are role models for the first-year students.

Earlier research

In a literature review, Stigmar (3) shows how both student assistants and the *tutees* benefited from *peer teaching*.

A study from the UK showed that PAL benefitted student assistants, the recipients of the student assistants' support, and the institutions. The students who participated in PAL experienced a smoother, more assured transition to higher education, felt a greater sense of belonging and gained greater confidence in their academic ability.

Friendships were developed, and students' social integration to their learning environment was enhanced. Academically, they took more responsibility for their own learning, engaged more, improved their grades and were more likely to complete their study programme than the students who were not involved in PAL. The drop-out rate fell at the educational institutions and the students were more satisfied (13).

PAL improves academic skills, allows for dialogue in the learning process, and reduces students' anxieties because the student assistants seem less intimidating than the subject teachers, with whom the relationship is asymmetric (3).

Universities Norway emphasises the importance of supervisory competence in health and social care study programmes (14). Being a student assistant is a learning arena for developing teaching competence.

National examination in APB

The national examination in APB showed a failure rate of 29 per cent in 2015 (15) and 22 per cent in 2018 (16). Kyte et al. (17) have shown that the failure rate in APB is higher than in other subjects in the nursing study programme.

The student population in higher education is heterogeneous, and the students' qualifications upon admission vary widely. In Norway, the academic admission criteria for the nursing study programme do not include natural science. Consequently, the students' prior knowledge varies considerably. Admission grades have been relatively low at times (18).

The aforementioned factors present teaching challenges. Where the subject material requires more prior knowledge than the students possess, the teacher moves beyond the relevant level of knowledge that can be expected, according to Vygotsky. He further argues that students can achieve a higher level of knowledge when academic support is facilitated in the students' nearest zone of development (8).

Student assistant programme

In order to meet the challenges of a high failure rate (15, 16), the subject teacher introduced the nursing students to a supplementary learning method in the form of PAL. The recruitment of student assistants entailed two competent third-year students, one of whom had achieved grade A in the APB exam, offering to be student assistants outside the scheduled learning activities.

They introduced themselves to the class, and their contact details were entered in the electronic learning platform Fronter, where teachers and students can communicate with each other. The subject teacher was available if the student assistants needed them, and the subject teacher linked up interested students with student assistants.

«In order to meet the challenges of a high failure rate, the subject teacher introduced the nursing students to a supplementary learning method in the form of PAL.»

The student assistants responded to emails, held weekly group sessions with two to six students, or provided one-to-one supervision during the autumn semester where this was requested. Some students met weekly, others only once or twice in total. Exam questions and topics that students found difficult were reviewed.

The student assistants contributed to vertical peer support and peer teaching in groups, according to the definition of these terms above. The focus was on dialogue based on the individual student's learning process and need for knowledge.

The aim of the student assistant programme was to introduce a student-active learning method to small groups, and to improve the quality of the study programme and the teaching skills of the student assistants.

Objective of the study

The objective of the study was to gain knowledge about the students' experiences with PAL in APB.

Method

This study, which is part of a cross-sectional study, analyses thematic free-text responses to two of six open-ended questions from a structured questionnaire, which was answered anonymously via Fronter. We present some quantitative findings which we consider relevant to gaining an overall understanding.

The questionnaire consisted of 38 questions, including six with free-text responses. Of the 175 first-year students studying for a bachelor's degree in nursing, 108 (62 per cent) responded. Nineteen (17.6 per cent) of these indicated that they had availed themselves of the student assistant programme, and all 19 answered the question about their experiences with PAL.

This study examines the responses of these 19 students. In addition, we present an overview of the examination results for the students who did not use student assistants and for the 19 who did.

Ethical considerations

The students were informed about the study in Fronter and during their lectures. The data was treated confidentially and anonymised. The study was approved by the department head and the Norwegian Centre for Research Data, project number 48826.

Content analysis of free-text responses

Metacognition can be defined as reflection on learning strategies and awareness and understanding of one's own learning processes (19), such as thinking about how to achieve a goal like passing an exam.

In order to elucidate nuances and diversity in the learning process, open-ended questions are considered to be more appropriate than structured multiple-choice questions, where researchers categorise the answers to fit their own understanding of reality. The APB subject teacher wanted to explore students' experiences with using student assistants, and free-text responses were considered appropriate. In the questionnaire, we wanted to ascertain students' reflections on their learning process by, for example, asking the following questions:

1. If you availed yourself of the student assistant programme, what learning outcomes did you achieve?

2. If you did not avail yourself of the student assistant programme, what prevented you from doing so?

The researchers conducted a thematic content analysis of the responses. The analysis process started with the researchers reading the students' answers repeatedly to form an overall impression. We then analysed the texts individually and identified meaningful entities which we could discuss and jointly compare.

We condensed the units into subcategories, which we compared and discussed. Finally, we abstracted the subcategories into main categories. Condensation and abstraction entailed interpretation based on hermeneutic principles such as part – whole and bias – understanding (20). The analysis process is illustrated in Tables 1 and 2.

Results

The results showed that using student assistants gave students a better understanding of the subject content and inspired learning. The students' prerequisites for passing the exam were improved. Table 1 shows the main categories, the subcategories, and a section of meaningful entities from the material related to question 1: 'If you availed yourself of the student assistant programme, what learning outcomes did you achieve?.

Table 1. Learning outcomes from using student assistants

Main category 1: Better understanding of the subject content

Subcategory	Example of meaningful unit
The importance of explaining in a way that makes it easier to understand the subject	'It helped me a lot, they were really good at motivating me and explaining the anatomy I found difficult. [...] They helped me to really understand anatomy. They also gave me some helpful tips on easy ways to learn the subject.'
The importance of achieving a good learning outcome	«'It was a huge help to my understanding of the subject. They managed to explain various things in a more understandable way than was explained in the book.'
The importance of identifying knowledge gaps	'Very good, it gave me an idea of what I needed to practice more on.'
The importance of feeling secure	'Great help. Whatever you were wondering about you could just ask, several times, and get it explained in different ways so you could understand.'
The importance of availability and spending enough time	'[...] they always took the time to explain no matter what. It helped me a lot.'

Main category 2: Inspired learning

Subcategory	Example of meaningful unit
The importance of the student assistants boosting motivation	'A lot of the most difficult stuff was fun, and I was also more motivated to continue reading/practising/understanding [...].'
The importance of dedicated student assistants	'Motivated, dedicated, focused students who really did what they could. They came to school if we needed it, responded to messages, explained things in different ways, didn't give up until we understood. Very worthwhile!'

Main category 3: Prerequisites for passing the exam

Subcategory	Example of meaningful unit
The importance of learning through student assistants	'I think I can say that if I hadn't received help with some of the main topics, I probably wouldn't have passed the exam.'

Only 19 of the 108 students used the student assistants, and we were interested in finding out the students' reasons. Table 2 shows the main categories, the subcategories, and a selection of meaningful entities from our data that answers question 2: 'If you did not avail yourself of the student assistant programme, what prevented you from doing so?'. Our main findings were that they wanted to study independently, lacked external framework factors such as time, faced barriers to seeking help, and were not aware of the student assistant programme.

Table 2. Reasons for not using student assistants

Main category 1: Independent study

Subcategory	Example of meaningful unit
The importance of studying/learning independently	'I didn't feel like I needed it, plus I tend to work best alone.'
Not needed	'I thought my own reading strategies were enough [...] wish I'd taken up the offer of help.'

Main category 2: Students' external framework factors

Subcategory	Example of meaningful unit
Lack of time (family, work)	'I didn't have enough time I prioritised the wrong things.' 'Three children, job, just not enough time.' 'Sick children.'

Main category 3: Barriers to seeking help

Subcategory	Example of meaningful unit
The importance of not being alone	'Nobody I knew would do it, so I didn't want to go on my own.'
The importance of fear of asking for help	'The thought of asking for help was a bit scary.'

Main category 4: Lack of information about the programme

Subcategory	Example of meaningful unit
The importance of students' lack of comprehension of written and spoken information	'I didn't know we could do that.'

Examination results

The variance in group sizes makes it difficult to compare the exam results. Of the 19 who made use of student assistants, 11 attained a B or C grade, and three failed. This is a better result than that of the 140 who did not participate. The quantitative data from the questionnaire showing a comparison of exam grades between those who used student assistants and those who did not is presented in Table 3.

Table 3. Comparison of exam results

Exam grade	No. of students with grade – full cohort (n = 159)	No. of students with grade – using student assistants (n = 19)	No. of students with grade – without using student assistants (n = 140)
A	6 (3,7 %)	0 (0,0 %)	6 (4,3 %)
B	16 (10,2 %)	5 (26,3 %)	11 (7,9 %)
C	28 (17,6 %)	6 (31,6 %)	22 (15,7 %)
D	27 (17,0 %)	3 (15,8 %)	24 (17,1 %)
E	19 (11,9 %)	2 (10,5 %)	17 (12,1 %)
F	63 (39,6 %)	3 (15,8 %)	60 (42,9 %)

Discussion

In the following, we mainly discuss the results from free-text question 1 since the main purpose of this study is to examine the student assistants' contribution to learning. Results from free-text question 2 helped to elucidate why so few availed themselves of the student assistant programme. Finally, we briefly discuss the exam results.

The main results from question 1 show that the student assistants provided academic and emotional support and were positive and inspirational role models. One student reported that she would not have passed the exam without them.

«The student assistants provided academic and emotional support and were positive and inspirational role models.»

Based on our analysis, we condensed 13 of the 19 responses from the students into the category 'Better understanding of the subject content'. We called this 'main category 1', and the discussion will therefore mainly revolve around this category.

Main category 1: Better understanding of the subject content

The students felt they had a better understanding of the subject content because the student assistants explained the subject clearly. They achieved a good learning outcome and identified knowledge gaps. They felt secure enough to ask the same questions repeatedly.

The students appreciated the fact that the student assistants made themselves available to them, and that they spent enough time with them to complete the learning process. The students felt that they were seen, and the student assistants never stopped trying to make them understand difficult topics.

Our findings correspond to the three areas ranked highest by first-year students who participated in the Capstick study (4): better understanding of subject content, opportunity to clarify basic concepts, and opportunity to voice concerns about the subject without involving the teacher.

Cognitive and social congruence

The students' perception that the subject content was easier to understand with help from the student assistants can be understood in light of Cornwall's theory of cognitive and social congruence (21). Cognitive congruence means that the knowledge base of students and student assistants is more similar than the knowledge base of students and subject teachers.

This can help student assistants to aim their explanations at the right level, making the subject easier to understand, partly because student assistants often use the same words as the students and find their 'code'.

An alternative understanding is that because the student assistants have recently studied the subject, they are able to share learning experiences and describe how they overcame their struggles and challenges (22).

Student assistants who have recently learned something, can be good at teaching because they are *consciously competent*: they have to think, step-by-step, how they learned a practical procedure or theory (23).

One study of medical students showed that a positive feature of student assistants is that they are not experts and therefore have a better understanding of what constitutes basic knowledge: 'When you are an expert like the faculty, what you think is basic is no longer basic' (22, p. 365).

The fact that student assistants have 'been there, done that' and have succeeded in their studies can be important in establishing a good relationship between the assistants and students. Students can be secure in the knowledge that the assistants know what it takes to master the studies, and the assistants feel confident in the subject (24).

Student assistants and students also share a social congruence: they have relatively similar social roles. This can create a sense of security and promote learning (22, 25).

The use of student assistants can lead to a different learning dynamic. The students felt that there was substantial scope to ask questions, and that topics were explained from different angles until everyone understood. This shows that there were active discussions and dialogues between student assistants and students, which corresponds to the core values of PAL (4).

«A pervasive theme in the responses was that the sense of security is important for learning.»

In small groups, the student assistants can encourage students to acquire knowledge (indirect *tutoring*), reason and come up with their own answers. There is little time and space for such learning methods and they can be difficult to implement in auditorium-based teaching, which usually involves more direct knowledge dissemination.

A sense of security

A pervasive theme in the responses was that the sense of security is important for learning. Many students probably find it less intimidating to show weakness, try and fail, as well as ask questions to a student than to a teacher, and in a small group versus a large auditorium. The importance of security is in line with Hammond et al. (26) and Capstick (4), who found that *peer teaching* enables students to discuss and work on topics from the syllabus in an environment that is perceived as non-threatening.

The zone of proximal development

The results seem to show that one of the learning outcomes for students who used the student assistants is a better understanding of APB. Proximal development zone theory may shed light on the impact of student assistants' help in terms of contributing to learning. When the content of a textbook is within the students' understanding, it is easy for them to read it on their own. The further they are from understanding the syllabus, the more help is needed in the zone of proximal development.

According to Vygotsky, this zone is the area between what a student is currently mastering and what he/she has the potential to master. An important role for the teacher is to structure the syllabus and provide help and support in a way that enables students to strive towards their potential levels of development (8).

Asghar's study (27) supports the notion that subject material can be better understood through interaction between *peers* helping first-year students to access the zone of proximal development, where they can enter a new area of potential development by solving problems together with students who have more knowledge.

Main category 2: Inspired learning

Some students highlighted the importance of student assistants motivating learning through being competent and dedicated. The students were inspired because they understood the importance of knowledge and wanted to learn. The fact that student assistants motivated learning can be understood in light of Bandura's social-cognitive learning theory. Learning takes place through continuous participation in a community of practice (11), and the advanced students are one step closer to the goal of becoming professionally competent nurses.

«The students were inspired because they understood the importance of knowledge and wanted to learn.»

Experiencing meaning is important in all learning. According to Wenger (12), by actively participating in a community of practice, an individual identity is created where goals and interests are shared. According to Lave and Wenger (28), when people meet and interact, learning is taking place continuously. The novice first learns through peripheral participation, then gradually moves towards expertise.

Good role models

By participating in groups with good role models, the new students are absorbed into a common cultural practice. Interaction with more experienced students motivates learning. Students can identify with the future professional role.

When student assistants show that they have succeeded in their studies, it may help students to recognise the benefits of receiving advice from their role models. Practical and emotional support from an experienced student can help the less experienced students understand how to master their studies. Sharing experiences with role models is beneficial, and the opportunity for this may be a key factor in understanding positive PAL effects (28). Capstick (4) found that through sharing their own experiences, student assistants were often seen as an important source of advice and knowledge.

Main category 3: Prerequisites for passing the exam

One student believed that she would not have passed the exam without close supervision from the student assistants. Asgari and Carter (30), among others, found that student assistants can provide examination support. They compared the grades of one group of beginner psychology students who received help and one control group who did not receive help. The first group achieved a significantly better result in the exam. This was because new students felt they were seen by the student assistants, and because they found it meaningful that someone wanted them to succeed. Student assistants can help navigate the new student role.

It is difficult to interpret the exam results in our study since the two groups varied considerably. One of the students who did not use the student assistants wrote in a free-text response that they regretted not seeking help. They found that their self-insight into study strategies was lacking.

Limitations of the study

We prepared the questionnaire and analysed the data, which means that our prior understanding may have influenced the results in favour of using student assistants (20). However, only one of us is an APB teacher.

A total of 19 of 108 students took advantage of the student assistant programme. The low participation rate can skew the findings since the most motivated students participated and were therefore also positive about the programme. Data from the study showed that 12 of the 19 (63.2 per cent) were highly motivated to learn APB, and 7 (36.8 per cent) were moderately motivated. No one reported a low level of motivation.

Compared to the cohort as a whole, the results were as follows: 61.6 per cent were highly motivated, 36.1 per cent were moderately motivated and 2.8 per cent were not particularly motivated. These numbers suggest that the 19 are relatively representative of the cohort in terms of motivation, i.e. they were not more motivated to learn AFB than the cohort as a whole.

Sixty-two per cent of the cohort responded to the questionnaire. Thus, there may well have been more than 19 who had contact with the student assistants. These students may have had different experiences from those who participated in the study, or they may have had negative experiences.

Negative experiences with PAL

This article highlights the positive effects of PAL. In terms of the limitations and negative effects of PAL, some students are resistant to collaborative learning. Others think there is too little structure in the sessions, and that they could have used the time more effectively on other things. Some also found that the student assistant did not have the level of knowledge that they had expected, and that the framework factors were a barrier to the implementation of PAL (4).

An alternative approach to gaining insight into students' perceived learning outcomes could be through individual interviews or focus group interviews. The dynamics of a focus group can produce different points of view, new perspectives and different nuances of meaning in a topic. Focus group interviews are suitable for exploratory investigations of new or under-investigated practices and research areas (20).

Conclusion

Measuring the learning outcomes that can be achieved in different learning methods such as PAL can be a complicated process due to the large number of variables entailed. Our findings suggest that PAL can facilitate learning. We would recommend using student assistants as an 'extension of the teacher's arm', i.e. as a supplement and not a substitute for professional teachers.

Students need academic support to be provided Pen small groups, where it is easier to facilitate learning based on the individual student's perspective than it is for a subject teacher in a large class. Student assistants' awareness of the students' prior knowledge enables them to provide a different dimension of academic support than that of the subject teacher.

Another advantage of small groups is the contribution to student-active learning, which is in great demand in higher education. Dialogue is essential for learning and can help more students reach a higher level of development than they would manage on their own. It is inside the zone of proximal development and through 'scaffolding' that learning and development can take place in the interaction with someone who is more knowledgeable than oneself. Learning is a social process that takes place in a community of practice with common goals, which gives meaning and builds identities.

Our main findings in the study are that the students who availed themselves of the student assistant programme gained a better understanding of the subject content and were inspired to learn.

Whether seminars with student assistants should be made compulsory is open to debate. Findings from our survey show that some students are happiest when studying on their own. If student assistant programmes were to be made compulsory, it would be interesting to carry out a follow-up study.

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