

## **Improving teaching activities in a classical journal club session - Activation and involvement of a larger number of students**

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### **Introduction and Problem**

In recent years the total number of students at several educations is increasing. A result of this fact is that in some cases the teaching styles used in the compulsory courses need to be adjusted to be able to handle larger classes while still fulfilling the intended learning outcome for the course. One of the educations in which this holds true is the BSc education Biology-biotechnology wherein I am involved as a teacher in one of the compulsory courses, more specifically the course “Experimental Molecular Biology”. The course consists of a mix of lectures, laboratory exercises and journal clubs. In this project I will only focus on what problems the increase in student number might cause for the journal club part and how these problems may be solved.

### **Journal club as a teaching style**

A journal club has been defined as a situation in which a group of people meet to discuss research papers related to a certain research area, providing a forum to discuss and be updated in new or in many cases just relevant literature within a specific subject in this way being taught critical reading skills (Linzer 1987).

There are several arguments for why journal clubs are being used as a teaching style for both undergraduate and graduate students. It is a teaching style where the students will develop abilities within critical thinking while practicing interpretation of experimental design and data. In this way

illustrating how the students can adapt the experimental methods in their own work. Finally but not least, it is a good way to introduce the students to primary literature (McDonough 2012, Murray 2013).

*What is the intended learning outcome from the journal club?*

In general one can say that journal clubs will help the student become more familiar with advanced literature within a certain research area. In addition, the students will be trained in debating current topics within the chosen area and gain deeper understanding of the topics.

More specifically for the course “Experimental Molecular Biology” the intended learning outcome of the journal club part is: “*Acquire skills in critical examination and interpretation of scientific data; gain a theoretical background for the experimental exercises; practice oral communication of scientific concepts and learn to describe basic theoretical aspects of scientific research methodology*”, for more detail see course description (<http://kurser.ku.dk/course/lbif10208u/2013-2014>).

### **Limitation of the use of traditional journal club as a teaching style**

In a classical journal club the session consists of a presentation (individual/group) followed by an in-plenum discussion of one to several scientific papers. Thus, it can be discussed how many persons a “club” can consist of (especially in a teaching situation) while the intended learning outcome still can be reached. The class size also affects whether all students will take part in the discussion and for the teacher to be able to assess whether the learning outcome has been met. What the optimal number of students is in a journal club situation may vary between different situations, but my personal feeling is that when more than 20 students are present the overall outcome will decrease. Just the fact that students often feel insecure talking out loud in a big crowd can negatively affect the journal club situation. The students are afraid to show fellow student as well as the teacher what they do not understand. In addition, they might be unsure of how to phrase a specific question.

*Current and future journal club situation in the course “Experimental Molecular Biology”*

This year 39 students attended the course but within a few years the student number will increase to approximately 70. Currently the journal club is structured such that one group (4 students) are presenting one scientific

paper while an opponent group (4 students) will give feedback on the presentation and at least start the following in-plenum discussion. Each journal club takes two hours. Within these two hours one scientific paper is being discussed. Currently there is in total 10 journal clubs (10 papers), meaning all groups will present and be opponent once.

We have in the teacher group discussed the situation and briefly talked about the problem with the increasing student number. One solution could be having several journal clubs run in parallel with the same papers being discussed in each class room. This might not be a major problem, but it is important that the discussions will contain the same degree of information in each class room as the discussed papers will be part of the final assessment of the students. This solution will require more teachers (the program for the students makes it impossible for them to have lessons at different time points), and will thus require a high degree of coordination between the teachers such that the scientific content is comparable between each class room.

In this project I would like to investigate how the journal club situation can be optimized for a higher number of students and still result in the same learning outcome. How can you change the teaching style? What type of teaching activities could be included? As already stated there are currently 39 students in the class, which I personally find too many for in-plenum discussion. Therefore, I would like to find out what the students think about the current situation.

## **Data collection – Student survey**

In this project I have used a focus-group interview. The focus group consisted of seven students' three girls and four boys from this year's Experimental Molecular Biology course. The students freely volunteered for the interview in which I did not participate myself. In fact the students were unaware that a teacher from the course was involved in the investigation. I will also include the comments related to the journal club part of the course from the final student evaluation for the course. Finally, a few comments from the student evaluation from a different course "Frontiers in Plant Science" will be used. The reason for this is that this course is a journal club course in which I also taught. In both courses I tried to implement group work in two different ways to see if this could improve the teaching situation.

## Results – Student survey

Both from the interview and the two student evaluations it is clear that the students find it very important to have journal clubs for them to be able to learn how to read scientific papers.

*Focus-Group Citation 1 (FGC1): “Kan godt lide journal clubs...det jeg næsten får mest ud af” “Det der med at læse artikler.. kan jeg ikke finde ud af.”*

*FGC2: “Får meget ud af at arbejde med journals... det er rigtigt godt”*

*Evaluation comment 1 (EC1): “The journal clubs are amazing!”*

Furthermore, the students think it is very important to have allocated time to discuss science and to relate to their own findings in the laboratory exercises.

*EC1: “Journal clubs var helt fantastiske. Dejligt endelig at få lov til at diskutere artikler.”*

*EC2: “The discussion in the journal Clubs provided new insights and the questions asking for something that I probably wouldn’t have thought about otherwise.”*

*EC3: “JC, hvor man får lov til at analysere og kritisere de anvendte molekylær biologiske teknikker og reletere til vores exercise.”*

*EC4: “JC worked really well when the articles complimented the topic or method we were working on in the lab.”*

### What do the students think about the way the journal club currently is processed?

When asking the students what they think about the current format of the journal club session the answers can be split into two groups. Some students find the format as it is now good and inspiring and that the responsibility for gain of knowledge is up to the individual student.

*FGC1: “Synes det er ok... forventning om, at når jeg går der fra forstår mere men ikke alt”*

*FGC2: “Hvis man ikke får noget ud af det må man kigge ind af, man kan altid spørge undervejs”*

*EC1: “Journal club presentation is a good way of working with the articles even though you get more out of you own journal presentation.”*

On the other hand it became clear from the focus-group interview that a large segment of the students does not agree in this. The general trend among this group of students is that the student activation in the current journal club situation is too limited. They also find it problematic that not all students are equally prepared for the journal club session. And that it is a problem that they do not feel prepared to be able to ask relevant questions.

*FGC1: "Fungerer ikke at der er en enkelt gruppe der skal sætte sig helt vildt godt ind i det og en opponent gruppe der skal sætte sig forholdsvis godt ind i det og de andre godt men ikke lige så godt grænse for hvor godt. Dem der fremlægger, forstår først det hele efter at have snakket med den ansvarlige og den forståelse mangler ALLE Jo!...." "Dem der stiller spørgsmål har ikke grundlaget for det."*

*FGC2: "...det er lidt diffust når man ikke selv har siddet og arbejdet med det og selv diskuteret"*

A few comments were also directed towards the practical settings of the journal club for instance it was pointed out that the room wherein the journal club is held could be more optimal. Currently the journal club is held in an auditorium, which means that all students are facing in one direction except the group presenting the paper. And that, due to the fact that the journal club session is guided by 10 different teachers, it is important with a general structure of the sessions, which all teachers follow.

*FGC1: "Som det er nu er det ikke en klub, ikke jc nogle fremlægger og er på:." "tænk på hvordan vi sidder.. alle sidder og kigger ned på dem (dem der præsenterer)"*

*EC1: "Make sure all the teachers know what to do in the journal clubs - it was confusing that it was different every week."*

### **What should be changed in the current format and why?**

The overall trend in the suggested changes is that the in-plenum discussion does not work out due to the number of students, it is simply too large a crowd. It is also clear that the students want to be actively involved in the discussion and that they find it difficult in the current situation. They also point to the fact that they do not spend the same time preparing for the class if they are not involved in the presentation or opponent group. They suggest that the students should be encouraged to prepare in teams before each session. They indicate that they know that it would be beneficial to

prepare better, but it seems that the preparation might have to be structured for them to actually manage to do so.

*FGC1: “smartere hvis man teamede to journal grupper sammen, også skiftes til at fremlægge... meget federe” “Større arbejdsbyrde men mindre forum meget mere øvelse i at fremlægge og at være kritisk osv.”*

*FGC2: “...hellere færre journal clubs og mere intensitet og større aktivitet per person ikke bare sidde passiv, det kommer man meget nemt til hvis man ikke har læst den der journal godt nok til at kunne stille spørgsmål”*

*FGC3: “...tænker alternativet kunne jo være at man rent faktisk bruger jc noget mere så jc kender hinanden så godt så de egentlig kan sidde lidt med artiklerne og diskutere dem før en anden gruppe fremlægger ... jeg fik jo super meget ud af at diskutere hvad det egentlig var jeg læste før vi skulle fremlægge”*

*FGC4: “...så er det jo netop godt at sidde og diskutere... jeg ville personligt få mere ud af det i et mindre forum”*

*FGC5: “hvis der var lagt op til at man i de forskellige jc lige sad og snakkede om hvad man egentlig lige havde læst og hvis der var noget man ikke forstår så man kommer til i bunds med den, så ville man inde til forelæsningen faktisk kunne stille relevante spørgsmål”*

### **Towards a solution: Group work**

In the two journal club sessions in which I was the responsible teacher I decided to implement group work covering specific parts of the presented papers. In both situations there was still a student presentation followed by a short in-plenum discussion before I introduced the group work.

In the course “Experimental Molecular Biology” I had made four questions covering different parts of the paper. The students were split into 8 groups (each containing one member from either the group presenting the paper or the opponent group). Group 1 and 2 was asked to start with question 1, group 3 and 4 question 2 and so forth (all groups should look at all questions but in different order). After the group work we had an in-plenum sum-up where the two groups starting with the specific question was given the opportunity to answer first. This way I was sure that all groups were actively participating in the discussion and that all four questions would be covered.

In the other course “Frontiers in Plant Science” (15 students) I focused the group work around the methods used in the paper (as I had seen the power point presentation from the student, I knew this part was not being presented in detail). The students were split into 4 groups and each group was responsible for a specific method in relation to a given figure from the paper. Instead of specific questions, the students were given a figure from the paper. They should be able to explain how the figure was generated, suggest other methods that could have been used instead and in which other cases this specific method could be used. After end group work each group came to the black board and presented/discussed their findings by the aid of power point slides that I had prepared for them to use if they wanted.

*What do the students think about this teaching activity? - In comparison to the traditional journal club style with in-plenum discussion*

In general I would say that there was a very positive atmosphere at the two sessions this is in accordance with the conclusion Prince (2004) came up with. Prince concluded that the time spend in groups has a positive effect on student attitude and that collaborative work furthermore enhances student retention and the general academic achievement.

As the focus-group interview was held before my actual teaching I can only use the comments from the evaluation form from the two courses. From these comments I can conclude that the students do like to work in groups and that they find it relevant in combination with the journal club.

*EC1: “JC artikler kunne man have færre af, men give mulighed for at flere grupper arbejder med dem i grupper.”*

*EC2: “Include some theoretical exercises as part of JC or in the breaks in the lab (example: like theoretical exercises Lisbeth made after the JC during exercise G (yeast)).”*

*EC3: “Journal Clubs følte jeg var lidt for lange i det. Her ville jeg hellere have haft en time med journal præsentation, spørgsmål til artiklen og feedback end at det skal tage to timer det hele. Den sidste time kunne blive brugt til at lave teoretiske øvelser som derefter skulle gennemgås i plenum. De teoretiske øvelser skulle afspejle opgaver der kunne komme til eksamen, således at man er bedre klædt på til eksamen.” Evaluation result Trends in Plant Science: ”*

*EC4: “Formen af undervisning har været rigtig god, det har fungeret med en intro til emnet herefter en præsentation (JC) og*

*så at man selv skulle arbejde med dele af artiklen i de små grupper!?”*

## **Alternative teaching activities, which advantageously could be implemented**

In this project I have only tested if the use of group work during a classical journal club session could increase student activation and promote a positive teaching environment. But several other teaching styles could be used while still supporting the intended learning outcome. What I have learned from the student survey is that (I) student activation during the session and (II) student preparation for the class is very important for the success of a journal club session. These two key issues are also in the literature stated as important factors for an effective journal club situation (Lee et al. 2005, Deenadayalan et al. 2008). I have therefore looked into what type of activities that could promote these two things.

*How can student activation and preparation be improved?*

One way to change the activities in-class could be to use a teaching style called “POGIL” an abbreviation for “Process Oriented Guided Inquiry Learning”. This is a student-centered teaching style where the students work in groups on material facilitated by the teacher (Murray 2013). It is a method in which the students in addition to content learning will be trained in process skills, and ability to invent and apply concepts. In relation to reading primary literature this activity can be integrated in a way where the students will be given for example figures, tables, part of the method section etc. from the paper and asked to explore the information, develop the concept related to a model and apply it in a new situation. The activity can also be used in the preparation time prior to the journal club where the students can be asked to study the general topic, content area and methods.

It is my feeling that the students would like to spend time prior to the journal club session to be prepared for the class but that it might be difficult for them to know exactly how to do this in the most beneficial way. One way to guide the students in this process could be to introduce the use of dialectical notes (McDonough 2012). The use of dialectical notes can also improve the participation in the discussion during the journal club session. It is a technique, which will help the students to pick out the important parts of a paper and in addition also help them to acknowledge what statements



in the paper they do not fully grasp (yet). The use of dialectical notes will increase the active reading by the students and help them to structure their preparation time for each session.

Iyengar et al. (2008) introduced a completely different setup for journal clubs. Instead of having a presentation followed by an in-plenum discussion, the students were asked to answer several question related to the paper before the in-class session. At the journal club the students were individually being asked to explain figures and tables. This part was followed by a discussion covering the paper and the beforehand posted questions. This method will help the students in the preparation and since the students do not know who is going to explain the figures all students will prepare equally well for each session and not only for the session in which they are “responsible”. This method will also activate many students during the class.

Deenadayalan et al. (2008) have through a systematic review of different ways of running an effective journal club come to several conclusions. Based on these conclusions they among other things recommend that prior to the in-class situation several broad questions related to the specific paper should be raised. These questions could guide/support the students during the preparation time and help them focusing on the important parts of the paper.

### **The learning outcome will if at all, be affected positively by the suggested changes**

It has been shown that the use of the POGIL method will increase student abilities and comfort level working with primary literature. This is of great importance for bachelor students (Murray 2013). I think it will improve the learning outcome to work in groups on defined parts of the paper supervised by the teacher compared to having a general discussion without a specific focus. Especially for bachelor students it is important to structure the teaching activities such that they will learn to focus on the important parts of a paper.

Using active reading and writing dialectical notes formulating questions before the class will guide the students to clearly identify what they do understand what they do not understand yet. The formulation of question in relation to what they do not understand might as well help the students overcome the fear of asking questions in a larger crowd. This I am sure will positively affect the learning outcome in the journal club session. I could also see this method used as a group preparation if students prefer to pre-

pare in small groups, where they before class can discuss their observations and find out if there is overlap between what they do not understand yet. They can help each other to come to a general understanding and if there is something none of them understand this part can be brought up during the journal club. This will also help the teacher to asses if the intended learning outcome has been reached. The same is the case if one chooses to raise broad/open questions related to the specific paper, which should support the intended learning outcome. The questions could help both the students and the teacher to be prepared for the in-class session.

## Conclusion and reflection

It has been interesting to learn what type of teaching activities the students prefer. It is not surprising to me that they prefer to be involved actively compared to passively listening, but it actually also seems as if they would not mind to spend more time on the preparation for the class. They suggest that they could prepare in groups and make pre-discussions before the actual lesson. I think that might be a very good idea however it might be impossible for some students due to private activities therefore I think the introduction of dialectical notes or broad questions linked to the paper could be an alternative to this suggestion.

I am definitely going to use group work in my future journal club sessions. The students argue that it led to frustration and misunderstandings that the journal clubs were not executed the same way each week. One solution to this problem could be that we in the teaching group agree on a more general way to carry out the sessions or at least spend time to explain the students that the journal club sessions can and will be executed in many ways but that they all still support the intended learning outcome.

Personally I think it is important to link the preparation time and the actual journal club situation as I think more students will be activated during class if they feel well prepared which will make them more self-confident in the in-class situation. Structuring the preparation time for the students, and linking it to the actual journal club situation would also be very beneficial if the solution is to run several journal clubs in parallel. It will be very helpful in the coordination between the teachers and will support the fact that the scientific content will be similar in each class room.

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