

Motivating Students to Read Research Articles in a Master Level Course

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Introduction

This report is a project related to a master level course (Advanced Fluorescence Spectroscopy and Microscopy, 7.5 ECTS, referred to as AFSM in the rest of the report). The AFSM course is a mandatory course for master students in the physical chemistry study programme at the Department of Chemistry, University of Copenhagen in the fourth block (from April to June 2023). But the course is also open to students in other study programmes, e.g., nano-science, physics and molecular biology. The main purpose of the course is to introduce the students fluorescence-based techniques and supply them with the tools for their later research projects. The course consists of three parts: course lectures, lab exercises and reading research articles (case study). This project concerns the last part of the course, in which the students are expected to gain competency:

“Read contemporary research papers on photophysics, understand them, present them and write a self-consistent essay on it.”

One may think that reading research articles is mainly useful for those students who plan to continue within academia after finishing their master programme. In fact, we do not expect all the students will take an academical career path. Most likely, the majority of the students will be working in the private sector. Hence, we do not make any assumptions about the students' career path. Instead, we view this course as part of their university activities to find ways to integrate and become integrated.(Tinto 2012). We want the students to employ learning strategies to become attractive candidates for certain jobs in the future.(Rienecker et al. 2015) As the modern technology is developing

rapidly in both academia and industry, one needs to be able to find inspiration and/or even solution in the published research articles. Ultimately, they will be able to use the existing knowledge to create new knowledge or techniques. It is a very useful skill to be able to read contemporary research articles for most of the students regardless of their career path. This sets the way we included the reading research articles as part of the AFSM course.

For most of the master students, it is the first time to take an advanced course which involves reading research articles in depth and presenting them to the others in the course. This requires their active participation. Based on previous years' experience, the students were lacking motivation to carry out the literature reading. As it is not the "typical" course they are used to, in which they are just listening to the teachers' lectures. Students' motivation is closely related to the quality of their learning experience (Pintrich 2003) and learning outcomes, which has been reported in a similar molecular spectroscopy hand-on course. (Jurisevic et al. 2012) Hence, in this project we used different ways and try to motivate the students to participate and learn actively in reading research articles

Approach and Method of Analysis

Two different types of motivations can be used to activate the students: intrinsic motivation and extrinsic motivation. In the case of intrinsic motivation (acting out of interest, curiosity, and abiding values), the learning activities are tied to inherent enjoyment and interest in learning the knowledge and doing the tasks. This represents the highest level of self-determination. For extrinsic motivation (e.g. best-student awards, honor roles, pizzas for reading, passing exam), the reasons for engaging in learning are superficial to learning such that it is rather instrumental for achieving other benefits. (Bureau et al. 2022) These two motivations can coexist and are not contradictory. Whereas intrinsic motivation was steadily associated to better achievement. (Lemos and Verissimo 2013)

In the project we used different activities to primarily activate students' intrinsic motivation. These activities included: (1) We gave students the chance to present themselves at the beginning of the lectures,

and we chose the articles which are related to their (at least some of the students') research project; (2) During the lecture, we showed the students fluorescence spectroscopies and microscopy are very useful tools in both real world (company products, medical services) and scientific research (well-known research results). But we also used extrinsic motivation which activates the students and develops their intrinsic motivation. The activity was: For one of the articles (Energy Transfer paper), I mentioned to the students that some of the key information in the article will be in the final exam. Furthermore, we also combined intrinsic and extrinsic way to motivate the students: We assigned two groups (~4 students/group), one group would be presenting the research article to the rest of the class, one group would be acting as opponents and asking questions.

To gain and analysis the results of above-mentioned activities, I handed out questionnaires to the students using menti.com.

Results and Discussion

To evaluate which way(s) motivated the students the most to read the research articles, we asked the students to answer the question: "Which part(s) have motivated you to read the research papers?" (Figure 1). As we can see they prefer research papers related to their current research projects. This result is in agreement with the self-determination theory (Deci and Ryan 2013; Deci and Ryan 2004; Ryan and Deci 2000), one of the most comprehensive and empirically supported theories of motivation (Schunk et al. 2014), to foster the individual's intrinsic motivation, the conditions should support the individual's experience of autonomy, competence and relatedness.(Vaino et al. 2012) Some of them did think the lectures have made the topic to be interesting and motivated them to read the papers. Interestingly, we can see extrinsic motivation plays an important role, as most of the students think they have to read the papers because it is part of the activities to pass the course.

Which part(s) have motivated you to read the research papers

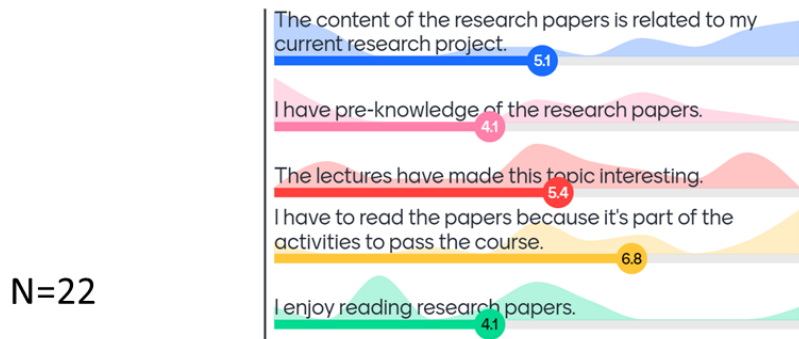
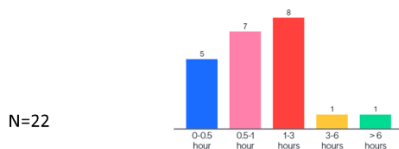


Fig. 1.

To quantitatively estimate how much the students were motivated to read the research articles, I asked them the question: “How many hours did you spend reading the research papers for the case study part? (hours/paper)” (left panel of Figure 2). Most of the students (10 out of 22) spend more than one hour reading each research article for different motivations. 1 out of 22 students spent more than 6 hours reading each article. This indicates the student might have been overwhelmed with reading during the course. On the other hand, there are still 5 out of 22 students who only spend less than half an hour reading each article. This indicates we still have a lot of work to do to motivate them to read the articles. Meanwhile, we also need to guide them properly so that some of them would not be overwhelmed.

How many hours did you spend reading the research papers for the case study part. (hours/paper)



How many hours did you spend reading the Energy Transfer paper.

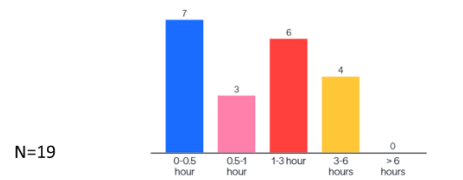


Fig. 2.

Based on the results from Figure 1, the exam seems to be the most important factor which motivates the students to read the articles. In one article reading case (the article deals with Energy Transfer), I mentioned that some of the key information in the article will be in the final exam. Then after this article reading session, I asked “How many hours did you spend reading the Energy Transfer paper?” (right panel of Figure 2). This indeed motivated some of the students to read the specific article, as 10 out of 19 students spent more than an hour

reading the article. But the number of students who spend less than half an hour is 7 out of 19. There could be different reasons for this, such as, the article is too simple for them as some of the students are carrying out projects on this topic; or they disliked being motivated by exams. I cannot conclude the reason for this at this point.

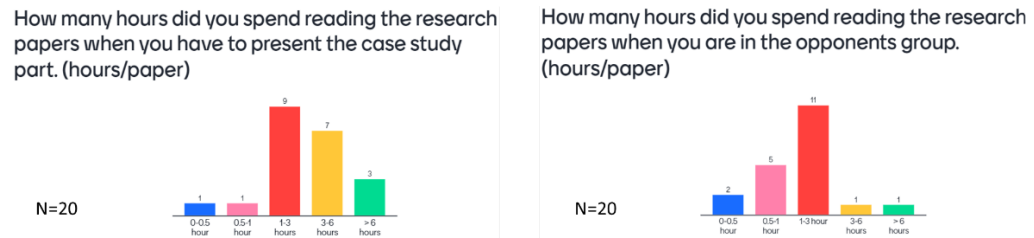


Fig. 3.

Oral presentation can serve as a great tool to motivate students to learn, gain self-esteem and become active learner.(Suliman 2022). The oral presentation is acting as both intrinsic and extrinsic motivation. In the research article reading part, we assigned a group of students (~4 students per group) to present the article and another group of students would be asking questions to facilitate the discussion with the participation of all students. In this way, we have motivated both two groups of students to read the research articles. As shown in Figure 3, I asked the students: (left panel) “How many hours did you spend reading the research papers when you have to present the case study part? (hours/paper)” and (right panel) “How many hours did you spend reading the research papers when you are in the opponents group. (hours/paper)”. Especially, if they have to present the article, most of them (18 out of 20) tend to spend more than 1 hour reading the article. The number is much higher than the average case (Figure 2 left panel).



Fig. 4.

The oral presentation is an effective way to motivate the students to read the research articles, which is confirmed by the students themselves. At the end of the survey (Figure 4), I ask the students: “Write your own idea about how you would prefer to be motivated to read the research articles”. They did think it is a good idea to present the article. They also would prefer to read articles which are more related to their own projects. Only one student mentioned “used in exam”. Hence, we can see the students prefer to be motivated intrinsically. Hence, in the future we should try to focus on intrinsic motivation, such as by choosing articles from the students’ perspective, providing more choice, and to ensure that article oral presentation tasks are optimally challenging(Deci et al. 2001).

Summary and Outlook

In this project, we used different activities to motivate the students to read research articles. These activities are both intrinsic and extrinsic motivations for the students. Extrinsic motivation plays an important role, but intrinsic motivation is preferred by the students, especially if the research articles are related to their current research projects. Among the different activities, oral presentation is the most effective way to motivate them to read research articles in this course.

In the coming years, I will continue to keep the oral presentation as part of the article reading session. I would also try to choose the articles which are closely related to the students' projects by carrying out a more detailed survey about the students at the start of the course. However, this might be difficult to implement as the students are from different research fields. To overcome this, I could consider giving the students appropriate freedom to choose the articles to read.

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