

Developing work placements in a discipline education

G. Velle *Uni Research Environment, Bergen, Norway*
and *Department of biology, University of Bergen, Bergen, Norway;*
T. Nielsen Hole *Department of biology, University of Bergen, Bergen, Norway*

ABSTRACT: Educational programs within higher education are often divided into discipline- and professional programs. Professional programs prepare students for a specific profession and include relevant theoretical- and practical knowledge. Discipline programs emphasize theoretical knowledge and research. Except for a career within research and higher education, discipline programs provide less obvious links to future careers. The transition from student life to working life may therefore be challenging.

In order to focus more on practical- and work-related activities and future careers, we have included work placement as part of the discipline study programs in biology at the University of Bergen. In this paper, we present and discuss the work placement and our experiences from developing work placement as a coursework.

The work placement is arranged as a course where the students work at least 140 hours at a workplace as biologist. In addition, the students write four open blog-posts about their work placement, submit one reflection essay to the course organizer and give a presentation on their experience from the work placement. In all assignments, the students reflect on the learning that takes place, rather than focusing on practical tasks that they have performed. The course teachers also meet with the students during the work placement and help to relate the knowledge learned at campus to work performed at the workplace. In addition, the roles of a biologist in today's society are presented for the students during the course.

Based on feedback from the students, other discipline study programs may benefit from including work placement. We hope that our experiences may be of aid.

Key words: Tacit knowledge, Blog, Reflection essay, University courses, Workplace learning

1 INTRODUCTION

Higher education is often divided into disciplinary and professional programs. Professional programs prepare students for a profession and include relevant theoretical- and occupational training. Discipline programs are linked to a scientific discipline, and the training is more aimed towards research, and students develop competence and expertise within a knowledge domain. The link to research ensures updated knowledge and these programs are therefore less sensitive to fluctuations in the job market than professional programs. However, except for a career within research and higher education, discipline programs provide less obvious links to and experience aimed at students' future occupations. Such links are sought after by many students in discipline programs and they express a wish for more practical and explicitly work-related activities in their curriculum (Hole *et al.*, 2016; NOKUT, 2014). This also echoes policy-makers' calls for increased workplace integration (Regjeringen, 2014, 2017), and supports research supporting that work placements can have positive impact on motivation (Gardner and Belland, 2012; Kyndt *et al.*, 2011), study progression (Næss *et al.*, 2012) and learning (Kennedy *et al.*, 2015).

While work placement is an integrated part of professional study programs, it is rarely used in discipline education in Norway. In the professional study programmes, practice is seen as an opportunity to observe and learn from the professional experts and experience relevant and authentic work settings (Bogo, 2006; Edwards *et al.*, 2004), preparing the students for a professional career after practice (Aldas *et al.*, 2010; Simons *et al.*, 2012). After all, some knowledge will only be learned after experience and execution (Dreyfus and Dreyfus, 1986; Polanyi, 1967). Most biologists in the work force use theoretical and practical knowledge in concert, which suggests that increased practical training will ease the transition from student life to working life.

Finally, work placement is a student active teaching method, which compared to traditional instruction is more beneficial for learning, and positively influence students' learning, achievement and knowledge retention (Freeman *et al.*, 2014; Singer *et al.*, 2013). In sum, opportunities for enhanced learning may be missed by traditional teaching practices. Work placements, if carefully planned and executed, have the potential to combine theoretical knowledge, student-active teaching and work-related activities beneficial for future careers. This training may also increase awareness of the students' transferable skills and foster new transferable skills.

In order to explore its potential, we have included work placements as a part of the discipline study program in biology at the University of Bergen. In this paper, we present and discuss the development of the work placement. We have improved the placement after feedback from students after their placement. In order to foster learning, we have followed Matthew *et al.* (2012) and Ryle (1949) and aimed at increasing the students' reflection about their learning. We have also aimed at increasing their understanding of the role of a biologist and made the work placement relevant for their in-campus education and future career, as highlighted by Matthew *et al.* (2012). Based on feedback from students, we think other study discipline programs may benefit from including work placement.

2 INITIATION AND INVITATION TO WORKPLACE HOSTS

During fall 2014, 45 institutions near Bergen were invited to be hosts for work placement students in biology. These include private- and governmental institutions and were selected because they were known by the course teachers to use biological competences during daily work. In the invitation, we described potential benefits for students and for hosts. For the host, that this is an opportunity to present themselves to students, meet potential future employees, obtain labour and build a closer connection to the education programmes. We emphasized that the work placement students should engage in biology-related tasks during their work placement, and will require appropriate training by the host. Thirteen hosts replied with a positive answer and the number of hosts have since varied from 12 to 15 (*Table 1*). Since the students chose workplace, the division of students (*Table 1*) shows that students prefer research- associated workplaces. Hosts related to education are less popular.

Table 1. Work placement hosts, with total number of students (Stu.) during the five semesters since the start of the work placement programme. Not all institutions have been hosts for the full period.

Host	Stu.	Sector
Institute of Marine Research	12	Marine research institute
Molecular Ecology laboratory (Uni Research)	6	Research institute on marine dynamics
Laboratory for freshwater ecology and inland fisheries (Uni Research)	5	Research institute on freshwater ecology- and monitoring
The Norwegian Institute for Water Research	4	Research foundation on water research
Norwegian Institute of Bioeconomy research	4	Research institute on biological resources
Norwegian Society for the Conservation of Nature	4	Organization for nature conservation
City of Bergen environmental agency	3	Agency on environmental matters
Runde Environmental Centre	2	Marine research station and exhibitions space
Section for applied marine research (Uni Research)	2	Research institute on marine research and pollution
The Botanical garden	1	Museum garden owned and ran by University
Nordahl Grieg School	1	Upper secondary school
Norwegian biodiversity information centre	1	National centre on information of species
The Heathland Centre at Lygra	1	Museum and information centre on heathlands
Biorecycling (Bioretur)	1	Company on the recycling of manure
Bergen Science Centre	0	Popular scientific centre for learning science
The Centre for Science Education	0	Education centre for science teachers

Initially, the workplaces were invited to be part of a three-level program which included: (1) first-year students were to spend one day observing biologists in the workforce, (2) first to second year students were to work 40 hours at the workplace, and (3) second to third year students were to work 140 hours at the workplace. Level 1 was dismissed since it became clear that it was of little interest for the

workplace hosts to have students looking over their shoulders without actually engaging in work, leaving little worth to both students and hosts.

The level 2 work placement was organized as a small course (bio198, 3 ECTS) so that eager students could join work placements in addition to a standard course progression. We evaluated bio198 after three semesters. In general, the students found the workplace practice interesting. However, the yield of 40 hours at a workplace was limited compared to the time spent for all parties; formal arrangements and contact between coordinator and hosts, enquiries, training and finding time in a full schedule of lectures and compulsory activities. Only nine students enrolled for the class during its running time. We therefore decided to terminate the course.

The level 3 practice (bio 298) is successfully running and is treated from here on in the paper.

3 BIO298 – WORK PLACEMENT

3.1 Background and aims

The bio298 work placement is primarily aimed at second- to third year students registered for the bachelor program in biology at the University of Bergen. Most students have a general background including courses in philosophy, mathematics, chemistry, evolution and ecology, and organismal biology. They have attended at least two weeks of field-classes and four weeks of laboratory classes. Some have also completed courses in cell biology, comparative physiology and molecular biology, and have more experience from the laboratory.

In the learning aims of bio298, it is stated that the work placement should give an understanding of how biology competence is used in the working force and in society, through engagement with workplace practices. The curriculum includes the workplace practice and a report. In addition, the students are provided with information on biologists and biology in today's society through a closed Facebook group, which proved to be an effective means of communication. Here, the course teachers regularly posts and comments on articles from the web concerning biologists and biology in today's society.

3.2 Curriculum 1: Work placement

All hosts write a short description of themselves in a document with typical tasks or projects that the students will perform. Many hosts have several projects, some of which may require specialized competences, which is described in the presentation. The students apply to sign up for the course. In their application, the students make a priority of hosts, and write a few sentences on their motivation to undertake a work placement. The course teachers pair student and host based on the application and available hosts. Most students get their first choice. At the beginning of the semester, the teachers meet with the students and inform them on the course and their assigned host. Then, the hosts and the students receive an e-mail with practical information, including report criteria. From then on, the teachers generally do not interact with the students. There are few mandatory activities during the work placements; the students are required to work least 140 hours, oblige to appointments made with the host and be a respectful to co-workers. This means that the students are given responsibility at the outset; they have to keep track of hours, schedule the work placement to other course activities at campus and ensure that the work they perform is up to standard.

The hosts are contacted at mid-term for a status report. At this time, the students and course tutors also meet in a seminar. The students are here asked to discuss aspects related to the learning that takes place in work placements; surprises, challenges, new competences fostered, competences they miss from their education, and transferrable skills that have been useful. The students discuss in groups with input from the course teachers.

3.3 Curriculum 2: The report

All hosts write a short description of themselves in a document with typical tasks or projects that the students will perform. The second part consists of a report including four blog posts, a reflection essay and a presentation. Here, the students discuss their learning and their own conception of activities, rather than only detailing the procedures that they have performed. In the blogs, students are asked to use pictures and write about their perspectives on their role as biologist and thoughts about working practices. The blogs are available at <https://biopraksis.b.uib.no>.

The reflection essay and presentation are given after the workplace practice. Here, the students sum up information from the blog-posts. As opposed to the blogs, the reflection essay is submitted to the course teachers and is not public. This implies that there is a lower threshold to be more critical to the work host. They also reflect on the learning that took place during the workplace practice, and how the course has given perspectives on the role of biology and biologists in today's society. In sum, the course teachers comment on the report and give the grade "pass" or "not pass".

4 COURSE EVALUATION

The course, as presented, has developed over the four semesters of running. The development is based on our experience as professional biologists and teachers, feedback from the workplace hosts and discussions with the students. We evaluated the constitutions of the course through a written questionnaire during fall 2016 (*Table 2*). According to the evaluations, the students are most satisfied with the Facebook page, the competence of the hosts and the acquired practical competence. We are also doing research to find how work placements influence the students' learning, motivation, awareness and learning of transferable skills. This will be presented in a later paper, but at this stage it interesting to note that after completing the course, one of the students decided to quit her biology studies. The workplace practice had given her the insight that biology was not for her.

Table 2. Summary of the bio298 evaluations fall 2016. Scale: 1- very dissatisfied to 7- very satisfied.

Question	Average score
To what extent did you find the mid-term meeting useful?	5.1
To what extent did you find the facebook page useful?	6.7
Did the hosts have high biological competence?	6.7
Did you have sufficient time with the host?	5.7
Did the host have sufficient pedagogic competence?	6.4
To what extent have the work placement given you contacts useful for future career?	5.1
To what extent have the work placement given new theoretical knowledge?	5.3
To what extent has the work placement given new practical competences?	6.3
Did you find the workload fit for 10 ECTS credits?	4.4
To what extent has the work placement motivated you for further biology studies?	6.9
To what extent have the work placement given insight into the role of biology in society?	6
Overall, how do you rate the course?	7

5 DISCUSSION

5.1 Assessment strategies

The hosts include a wide variety of workplaces (see Table 1), which is one of the hallmarks of a discipline education. That is, students become well versed in a set of knowledges and less so in particular occupations. However, this also presented a challenge for creating an overall assessment strategy for all the varied workplaces. The hosts have varied backgrounds meaning they might not always be equipped to assess students in a similar manner as is done in teacher training.

Literature on workplace learning often warns about a tension between the practical activity in workplaces and the learning in campus (Korthagan and Kessels, 1999; Schön, 1987). As such, the inclusion of diverse workplaces and dissemination through blogs can be one way to accommodate for these challenges. In addition, the course teachers help to relate learning in campus to the practical activity during the mid-term meeting, the student presentations and through the Facebook group. Although the nature of undergraduate biology work placements is different than, for instance teacher training, students might still find that work practices are different than what they have previously envisioned. This responds to calls for integration between curriculum and workplaces.

Our experience with blogs as an assessment seems to echo other studies which suggest that blogs can enable student reflections and learning (Cakir, 2013). The inclusion of blogs served three purposes. Firstly, given the diverse circumstances and sparse interaction with students during their placements, the course teachers could follow the student activity. Secondly, the workplace course aims to foster

awareness of competences and the students' understanding of their role as biologists. The students write about these matters, and this information was then afforded other students. Thirdly, it provides realistic training in writing. The blogs were read about 5000 times by 1250 persons during fall 2016.

5.2 Recognising the importance of knowledge outside the discipline

An important aim of the bio298 course has been to highlight that also non-biological competence is important in the working force. This is because students from discipline programs probably have a good grasp of competence specific to their discipline, but do not realize that they hold transferable skills since these are seldom emphasized during the courses, in the course evaluations or in the academic diplomas (Hyland & Johnson, 1998). This lack of insight into their extended competence was reflected in the national survey on student perceptions on the quality of study programs in Norway (NOKUT, 2014). Since employers seem to value transferrable skills more than the educators do (Ryssevik *et al.*, 2011), unawareness of their own full competence and potential may hamper newly graduated students in their search for relevant jobs. According to the bio298 students, some of the transferable skills they encounter during work placement include independence, project work, critical thinking, information acquisition and cooperation. It is also worth noting that several students independently have perceived the importance of learning other non-biology subjects taught at the university, such as statistics or chemistry, subsequent to work practice.

There are two themes that many students highlight as momentous during their work practice; the responsibility given to them and the challenge of assessing quality. They find the work authentic – this is not a tutorial where failing has no consequence. Such a responsibility can be surprising and scary, however we have had no negative feedback from students concerning a weight of responsibility. Rather, they state that it triggers an intrinsic motivation for learning (see also the score for motivation in Table 2). Related to this, there is no universal metric of quality. Experience is needed to assess what is «good enough» since it largely depends on the workplace and is weighted against time and other considerations.

6 ACKNOWLEDGEMENTS

The hosts include a wide variety of workplaces (see Table 1), which is one of the hallmarks of a We would like to thank the following people for valuable discussions and suggestions: All work placement students, Pernille Bronken Eidesen, Øyvind Fiksen, Oddfrid Førland, Kristin Holtermann, Lucas Jenø, Tom Klepaker, Gro van der Meeren, Arild Raaheim, Anne-Laure Simonelli and Vigdis Vandvik. The development of the workplace practice course and this paper was supported by The Centre of Excellence in Biology Education (bioCEED) and the project "How implementation of practice can improve relevance and quality in discipline and professional educations" financed by FINNUT in the Norwegian Research Council.

REFERENCES

- Aldas, T., Crispo, V., Johnson, N. and Price, T. A. (2010). Learning by Doing: The Wagner Plan from Classroom to Career. *Peer Review*, Vol. 12, No. 4, pp. 24-28.
- Bogo, M. (2006). Field Instruction in Social Work. *The Clinical Supervisor*, Vol. 24, No. 1-2, pp. 163-193. http://www.tandfonline.com/doi/abs/10.1300/J001v24n01_09
- Cakir, H. (2013). Use of blogs in pre-service teacher education to improve student engagement. *Computers & Education*, Vol. 68, No., pp. 244-252. www.sciencedirect.com/science/article/pii/S0360131513001413
- Dreyfus, H. L. and Dreyfus, S. E. (1986). *Mind over machine: the power of human intuition and expertise in the era of the computer*. New York: Free Press.
- Edwards, H., Smith, S., Courtney, M., Finlayson, K. and Chapman, H. (2004). The impact of clinical placement location on nursing students' competence and preparedness for practice. *Nurse Educ Today*, Vol. 24, No. 4, pp. 248-255.
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H. and Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, Vol. 111, No. 23, pp. 8410-8415. www.pnas.org/content/111/23/8410.abstract.

- Gardner, J. and Belland, B. R. (2012). A Conceptual Framework for Organizing Active Learning Experiences in Biology Instruction. *Journal of Science Education and Technology*, Vol. 21, No. 4, pp. 465-475. <http://dx.doi.org/10.1007/s10956-011-9338-8>.
- Hole, T. N., Jenø, L. M., Holtermann, K., Raaheim, A., Velle, G., Simonelli, A. and Vandvik, V. (2016). bioCEED Survey 2015. Retrieved from University of Bergen, BORA – Bergen Open Research Archive: <http://hdl.handle.net/1956/11952>, 78 pp.
- Kennedy, M., Billett, S., Gherardi, S. and Grealish, L. (2015). *Practice-based learning in higher education: jostling cultures*. New York, NY: Springer Berlin Heidelberg.
- Korthagan, F. and Kessels, J. (1999). Linking theory and practice: Changing the pedagogy of teacher education. *Educational Researcher*, Vol. 28, No. 4, pp. 4-17.
- Kyndt, E., Dochy, F., Struyven, K. and Cascallar, E. (2011). The direct and indirect effect of motivation for learning on students' approaches to learning through the perceptions of workload and task complexity. *Higher Education Research & Development*, Vol. 30, No. 2, pp. 135-150. <http://dx.doi.org/10.1080/07294360.2010.501329>.
- Matthew, S. M., Taylor, R. M. and Ellis, R. A. (2012). Relationships between students' experiences of learning in an undergraduate internship programme and new graduates' experiences of professional practice. *Higher Education*, Vol. 64, No. 4, pp. 529-542.
- NOKUT. (2014). The Norwegian Agency for Quality Assurance in Education www.studiebarometeret.no.
- Næss, T., Thune, T., Støren, L. A. and Vabø, A. (2012). *Samarbeid med arbeidslivet i studietiden. Omfang, typer og nytte av samarbeid. STEPOECD (2010-2011) AHELO: Assessment of higher education learning outcomes*. Retrieved from Oslo: NIFU Skriftserie, Vol. 48/2012.
- Polanyi, M. (1967). *The tacit dimension*. Garden City, NY: Doubleday Anchor.
- Regjeringen (2014). *Long-term plan for research and higher education 2015–2024* Report to the Storting 7 (2014–2015). Oslo: The Norwegian Ministry of Education.
- Regjeringen (2017). *Culture for quality in higher education*. Report to the Storting 16 (2016–2017). Oslo: The Norwegian Ministry of Education.
- Ryle, G. (1949). *The concept of mind*. London: Hutchinson.
- Ryssevik, J., Høgestøl, A., Dahle, M. and Holthe, I. C. (2011). *Kompetanse 2020 - Universitetsutdanningenes synlighet og relevans og samfunnets behov*. Bergen: IDEAS2EVIDENCE Rapport 4 / 2011, 208 pp.
- Schön, D. A. (1987). *Educating the Reflective Practitioner*. San Fransisco: Jossey Bass Publ.
- Simons, L., Fehr, L., Blank, N., Connell, H., Georganas, D., Fernandez, D. and Peterson, V. (2012). Lessons Learned from Experiential Learning: What Do Students Learn from a Practicum/ Internship. *International Journal of Teaching and Learning in Higher Education*, Vol. 24, No. 3, pp. 325-334
- Singer, S. R., Nielsen, N. R. and Schweingruber, H. A. (2013). Biology Education Research: Lessons and Future Directions. *CBE-Life Sciences Education*, Vol. 12, No. 2, pp. 129-132. <http://www.lifescied.org/content/12/2/129.short>