

## **Towards a better Alignment of PhD Student Development and Supervision Style**

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Supervision differs from other teaching situations mostly because it aims at supporting an individual student and because it is meant to provide guidance to the student over a relatively long period in time, especially in the case of PhD students. The process as well as the outcome is shaped by both the student and the supervisor and in fact most largely by their interaction in which not only the supervisor but also the PhD student should play an active role.

In biological sciences and related disciplines which require the PhD students to perform practical work, their supervisors are expected to serve as advisor for practical/technical questions (how to perform a given experiment?, how to employ a given method in the lab?) as well as a mentor (which experiments to perform and why?, how to manage a project?, how to pursue a career in science?). PhD students and postdocs who often serve as direct supervisors are typically not only student and supervisor but also very close colleagues who work on closely related research projects. They both learn and develop within the PhD student's three years or at least the period the supervisor works in the same research group. As a consequence the student's anticipation of the supervisor and the supervisor's expectations to the students change over time.

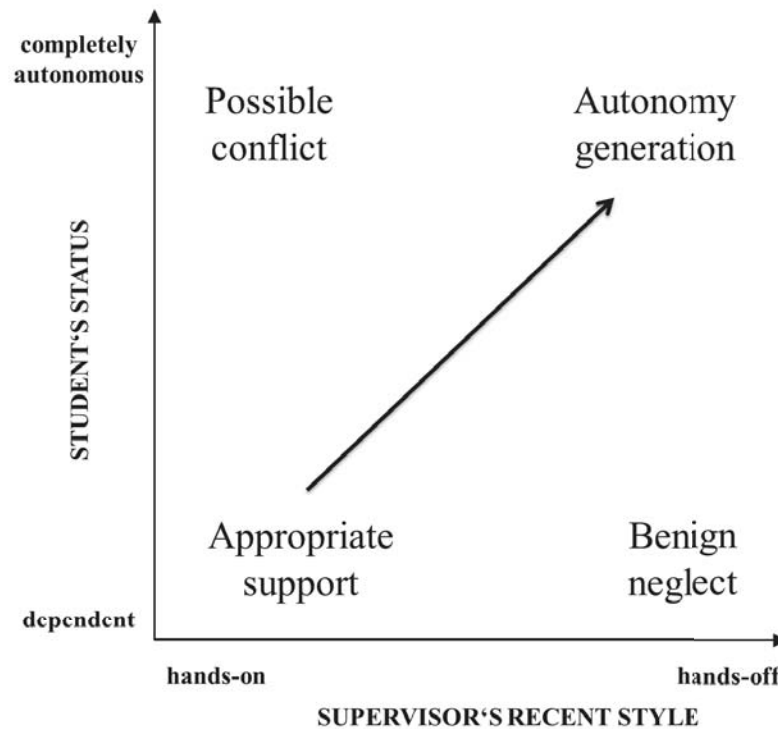
Adjustments have to be made to the needs of individual students as well as changing circumstances of projects. Supervision of PhD students therefore requires particular "awareness of the state of the relationship and flexibility to respond to inevitable changes" (Gurr 2001). This awareness is quite often not achieved despite the close supervision characterized for example by very frequent meetings as typically seen within biological sci-

ences. Whereas a lot of time is spent on discussing details of practical methods, scientific articles and research concepts, supervision does often not include continuous evaluation of the supervisory relationship and changes are not deliberately perceived and communicated. This makes it difficult for both supervisor and PhD student to respond to any change in an active manner. A major difficulty in addressing and possibly criticizing the supervisor's current style or the student's current approach may be that mutual feedback is required while PhD project is running which means before final assessment (Gurr 2001).

The dynamic nature of the relationship between PhD student and supervisor adds to one of the largest challenges in supervision in general, namely to find the right balance between control and freedom, involvement and distance for each student at a given point in time. This balance can be considered as prerequisite for the supervisor to provide adequate, timely help without interfering with the student's development. A seemingly simple question like "How is your experiment going?" can be interpreted as an attempt to take control if the student tries to gain more independence or as a sign of interest in the student's project if the student wishes more support. Likewise, not to ask could mean that the supervisor considers the student as independent or reflect a lack of interest in the student's project. Miscommunication can occur if the student and the supervisor judge the student's independence and/or the supervisor's style very differently.

To aid conversations in the supervisory relationship, Gurr (2001) introduced a two-dimensional representation of the perception of the current relationship between student and supervisor as a tool ("supervisor/student alignment model"; Fig. 24.1). In a study with four PhD students over a period of three years, using this tool "has led students to consider and discuss their supervisory needs concurrently with the supervisor considering the appropriateness of their own approach". Placing a cross in the two-dimensional plot depicted in figure 24.1 appears to offer a fast and simple way to describe the current supervisory relationship because it requires reflecting upon both the student's status and the supervisor's supervision style. Considering that a student can be more or less independent with regard to different parts of a project or different tasks at a certain point in time, using the supervisor/student alignment model as a tool can of course only serve as entry point to an open conversation about the current supervision situation.

Apart from a brief reflection upon the student's and the supervisor's current approach, placing the cross also requires to define what makes a



**Fig. 24.1.** Representation of the supervisor/student alignment model. Indicated are the outcomes of four combinations of student's state and supervisor's style and the hypothetical development. Redrawn from (Gurr 2001).

PhD student autonomous and what is considered as hands-off supervision. Different definitions on the student's and the supervisor's side could result in discrepancies in the positions of the crosses placed by the student and the supervisor even if they perceive the current relationship similarly. Assessing potential differences in how PhD students and supervisors look upon dependency and autonomy, control and freedom, could provide interesting insight to how different expectations on both sides impact the supervision process. With the aim of finding out what it is that makes a PhD student feel more or less independent and how on the other hand supervisors judge their students' independence, a survey was designed based on the supervisor/student alignment model.

## Design of the questionnaires

Two separate questionnaires designed for PhD students and supervisors consisted of six questions each (Fig. 24.2) and were sent out to all PhD

students and supervisors in the Department for Plant Biology and Biotechnology at LIFE. Those PhD students who have more than one supervisor were asked to choose one and reflect upon their relationship to that supervisor when answering the questions without talking to them.

The initial questions were related to the student's stage and the supervisor's role in the supervision process, respectively. In addition, PhD students and supervisors were asked to indicate how often they have scheduled meetings and how frequently they meet and talk spontaneously because the frequency of meetings may correlate with the perception of the current supervision style. Considering that PhD student and supervisor often also interact as colleagues, spontaneous conversations may not always be classified as supervision sessions.

The main part of the questionnaire then focused on the supervisory relationship as seen from the perspective of the supervisor and the PhD student. PhD students and supervisors were asked to describe their current interaction by placing a cross in the "supervisor/student alignment" plot (Fig. 24.3). To gain some insight into how the participants decided where to make their crosses, the PhD students were finally requested to give specific examples of situations in which they feel to be controlled/left alone and the supervisors were asked to provide examples which illustrate what they expect from an autonomous PhD student and when they feel the strongest need to take control. Since it was difficult to predict what students and supervisors consider as adequate support, these final questions were left open for the participants to comment on any possible aspect of the supervisory relationship.

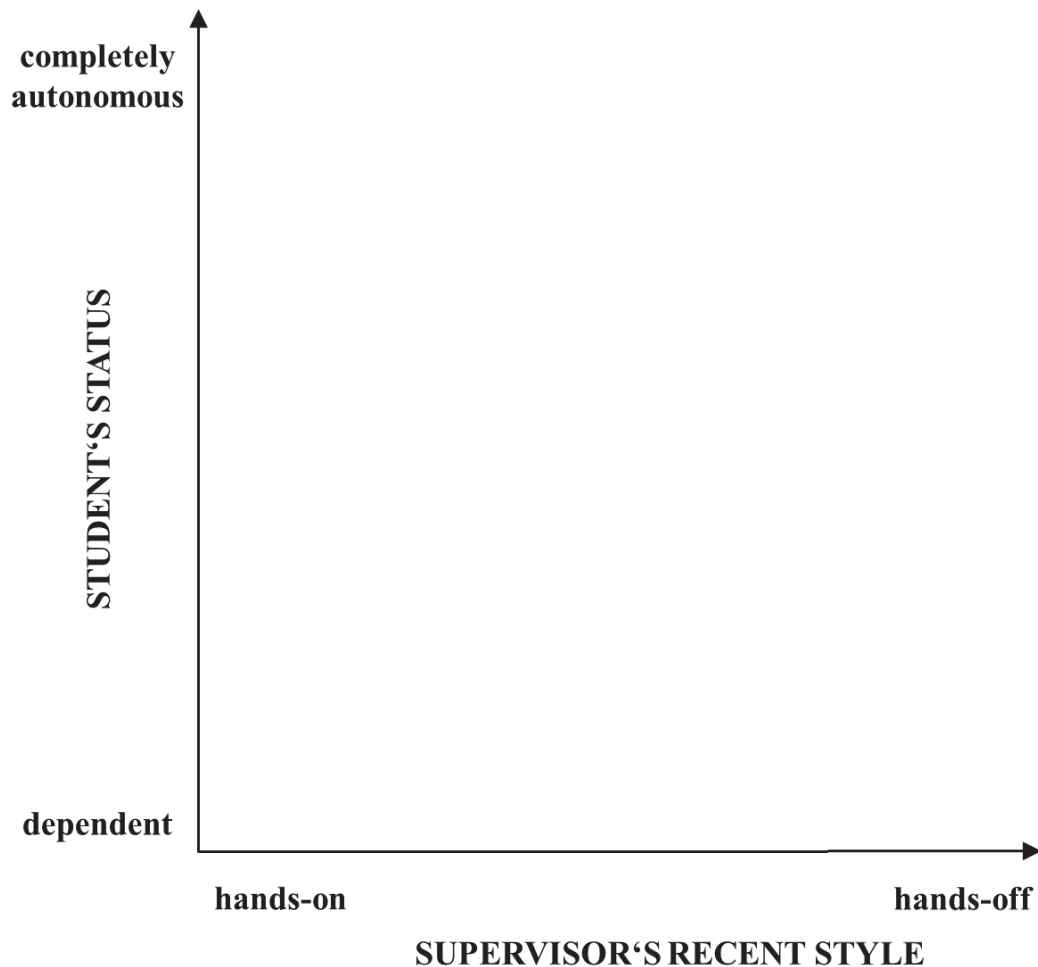
## Results

Ten PhD students and supervisors replied to the questions listed in figure 24.2. The pairs of a PhD student and his/her supervisor are referred to as pairs # 1-10, the individual PhD students as P1-10 and supervisors as S1-10. With the exception of one PhD student (P4), all students were in the second to third year of their PhD projects. Combining the frequency of scheduled and ad-hoc meetings, most of the PhD students who participated in the survey talk to their supervisors about once a week indicating a close interaction between student and supervisor (Fig. 24.4). Although the questions about the frequency of meetings had mainly been included to get an idea of the nature of communication between student and supervisor, the

Question	PhD students	Supervisors
1.	When did you start your PhD project?	What is your role as a supervisor? primary supervisor project supervisor on-bench supervisor
2.	How often do you have scheduled meetings with your supervisor? – 1-3 times a year – 3-6 times a year – about once a month – more often than that	How often do you have scheduled meetings with your student? – 1-3 times a year – 3-6 times a year – about once a month – more often than that
3.	How often do you have ad-hoc meetings with your supervisor? – 1-6 times a year – about once a month – about once a week – more often than that	How often do you have ad-hoc meetings with your supervisor? – 1-6 times a year – about once a month – about once a week – more often than that
4.	Please describe what the interaction with your supervisor has been like in the previous three months by placing an “x” on the figure below (see Figure 2).	Please describe what the interaction with your PhD student has been like in the previous three months by placing an “x” on the figure below (see Figure 2).
5.	Give an example of a situation in which you think your supervisor takes too much control.	Give an example of a situation in which you wish your PhD student was more autonomous.
6.	Give an example of a situation in which you think your supervisor takes too little control.	Give an example of a situation in which you wish your PhD student was less autonomous.

**Fig. 24.2.** Questions which were sent out to PhD students and their supervisors in separate questionnaires.

answers revealed some interesting observations. Only three pairs showed full agreement (Fig. 24.4; pairs # 2, 5 and 8). Five out of ten pairs gave the same answers when asked about the frequency of scheduled meetings but not regarding unscheduled meetings. In four of these cases (pairs # 3, 6, 7 and 9), the supervisors indicated more frequent ad-hoc meetings than their students. Pair 1 shows a surprisingly pronounced disagreement which might indicate that PhD student and supervisor have different ideas about what defines a supervision session.



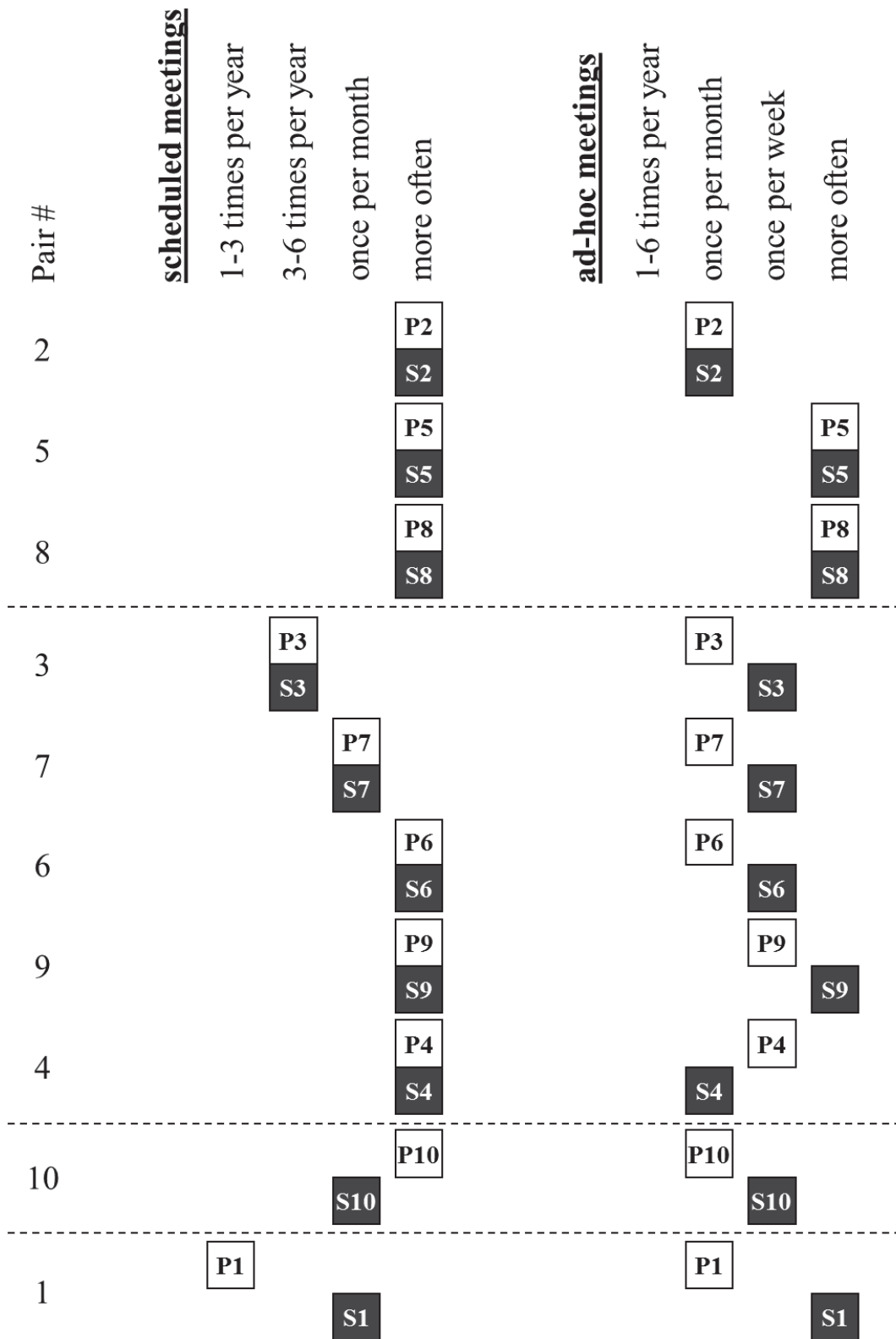
**Fig. 24.3.** Supervisor/student alignment plot used in the questionnaires. See also figure 24.2, question 4.

As short description of their perception of the current supervisory relationship, PhD students and supervisors were asked to place a cross in the supervisor/student alignment plot (Fig. 24.3; Fig. 24.2). Despite the option of participating anonymously, about two thirds of the participants chose to hand in their answers in person and to provide immediate feedback on this part of the questionnaire. Some described it as difficult to characterize their current supervision situation by making a single cross because in their opinion, more than one cross would be required to cover the different situations they typically experience. Other participants stated that placing the cross required more reflection than they had initially thought. They spent about ten minutes to complete the entire questionnaire.

Comparison of the positions of the crosses made by each pair of participants revealed pronounced discrepancies most cases (Fig. 24.5). Based on the relative position of the crosses, eight of the ten pairs were grouped into two categories (Fig. 24.5 A-B). In three cases (pairs # 1, 3 and 6; Fig. 24.5 A), the students considered themselves more independent than their supervisors described the students' status. Strikingly, the same three students described their supervisors' recent style as more hands-on than stated by the respective supervisors. When asked to give an example of how their supervisors take too much control, two of the three students stated that they would appreciate a higher degree of freedom to follow up on their own scientific hypotheses. Two of the respective supervisors think that their students are too autonomous when deciding which experiments should be carried out and which leads should be followed.

Five PhD students (P4, P5, P7, P9, P10; figure 24.5 B) seemed to see themselves as more dependent upon their supervisors' input than their supervisors think. Like the three students in the first group (Fig. 24.5 A), these students described the recent style of their supervisors as more hands-on than the supervisors themselves. As examples of circumstances under which their supervisors take too much control, the PhD students named rather diverse situations: interpretation of scientific results in a broader biological context, choice of the direction of scientific discussions, mail correspondence with collaboration partners, and choice of conferences. On the other hand, the same students would like to get more input with regard to specific aspects of their projects, details on practical methods and experimental design. One of the supervisors stated that his/her student should try to find answers to exactly this type of question more independently. None of the five supervisors in this group could think of a situation in which the student should be less autonomous than he/she is.

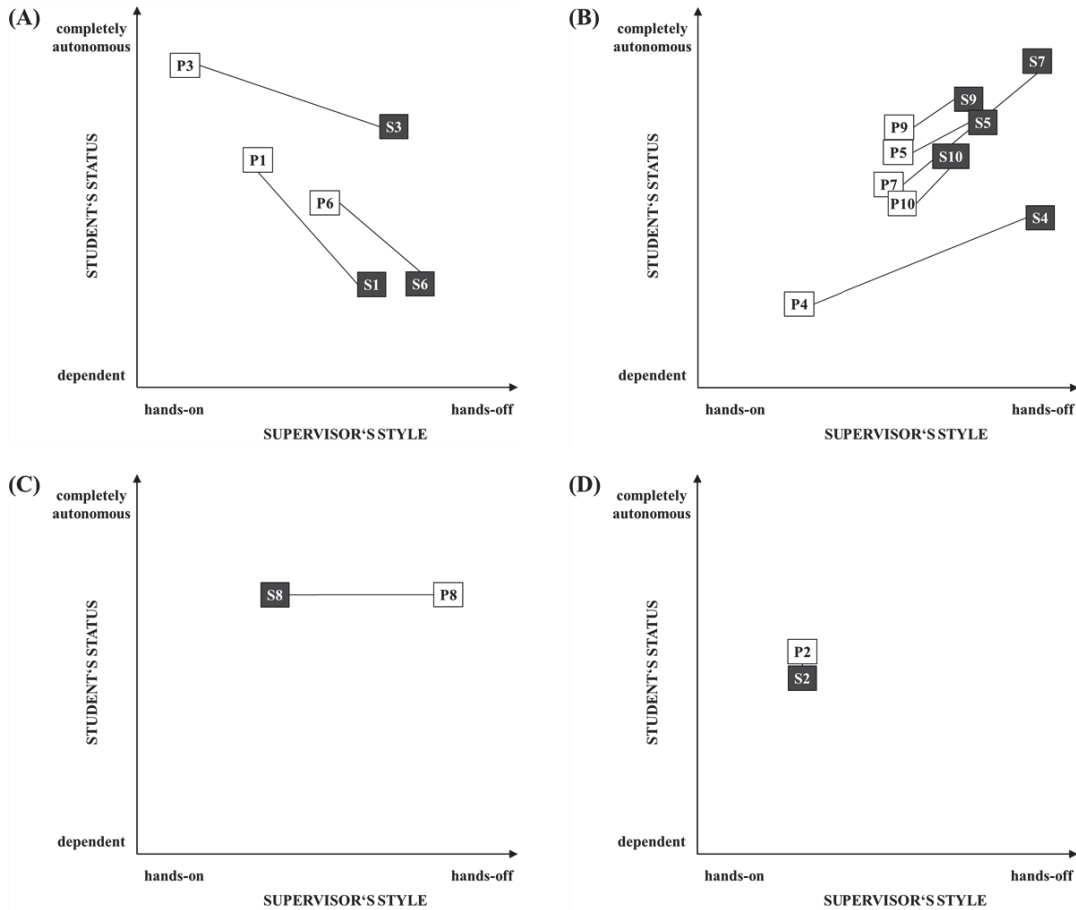
Pair # 8 (Fig. 24.5 C) differs from all others because it is the only case in which the supervisor considers his/her own style as more hands-on than described by the student, while both agreed on the student's current approach. As indicated in figure 24.4, PhD student and supervisor meet very frequently (more than one scheduled meeting per month and more than one ad-hoc meeting per week). The supervisor would like the student to plan experiments and analyze data more independently which is in line with the supervisor's perception of taking a mostly hands-on supervision approach. Finally, only one pair (pair # 2, Fig. 24.5 D) agreed upon both the student's status and the supervisor's style. In this case, the supervisor would like the student to show more autonomy upon experimental design and data analy-



**Fig. 24.4.** Frequency of scheduled meetings and ad-hoc meetings. The PhD students' answers are shown as white boxes (P1-10); black boxes illustrate the supervisors' answers (S1-10).



sis and less autonomy when “jumping to the next step although the previous step is shaky” (S2). Unfortunately, both students (P8 and P2) have not given any further description of the current supervision situation.



**Fig. 24.5.** Relative positions of the crosses placed in the supervisor/student alignment plot by the participants. Positions of the crosses are indicated by white boxes (PhD students P1-10) and black boxes (supervisors S1-10).

Taken together, nine of the ten supervisors who participated in the survey described in which way they expect their students to gain more autonomy. Five of them (S1, S2, S7, S8 and S9) expressed that the students should design and carry out experiments more independently. More specifically, the students should include all appropriate controls, find answers to small practical problems and analyze raw data without immediately consulting their supervisors. Two supervisors (S3 and S10) stated that their students should take more responsibility of their time line, i.e. the students

should realize themselves when and how much time to spend on paper and thesis writing. Two others (S5 and S6) think that their students should dedicate more time to reading of scientific articles in order to gain a more solid background knowledge required for the project (S5) or in order to get a better “strategic overview on what the project means” (S6).

The only four supervisors who also gave examples of too autonomous student behaviour (S1, S2, S6 and S8) all stated that they do not appreciate it when their students change a project’s priority, drop a possibly important lead or do experiments without allowing the supervisor to suggest improvements to the experimental design.

Seven of the PhD students gave examples of situations in which they feel that their supervisors do not give them enough freedom. These examples were more diverse than the supervisors’ answers summarized above. The most frequently described situations (mentioned by three students; P3, P4 and P5) were journal clubs or scientific meetings during which the students lack the opportunity to direct the discussion according to their own interest, to interpret their results in a larger context or to argue for their own hypotheses and ideas. One student expressed his/her wish to “try things out which the supervisor considers a waste of time but might improve the student’s understanding of things” (P1), while another student would appreciate more freedom to develop his/her own writing style (P8). Finally, one PhD student would like to be in charge of the mail correspondence with collaboration partners (P9).

Three PhD students (P4, P5 and P7) would appreciate closer guidance from their supervisors on how to set up experiments in the most efficient way as well as on details related to practical methods. By contrast, two PhD students (P8 and P9) would like their supervisors to take more control the structure and scientific directions of the working group as a whole. Another student expects the supervisor to encourage him/her to “participate in conferences, workshops or seminars considering that the supervisor should have more information about such events” (P5). PhD student P1 stated that his/her supervisor is generally not motivating and supportive enough.

## **Discussion**

As much as getting a PhD is about learning techniques, gaining knowledge and writing a thesis, it is also about developing towards an independent researcher. PhD students are therefore expected to gain autonomy in more

than one way over time and they can be more or less autonomous with regard to different aspects of their project. The various components of autonomy and dependency a PhD student may or may not have achieved could explain why some participants would have preferred to place more than one cross in the supervisor/student alignment plot. A PhD student's autonomy does not only vary between different aspects of the project at the same time but also changes over time. A successful student will gain an increasing level of independency during the PhD period but this development does not proceed at constant pace and will be interrupted by periods of increased dependence, e.g. in the beginning of thesis writing (Gurr 2001).

In the present survey, the PhD students used very different examples to illustrate the amount of control and the level of freedom they want which underlines their diverse needs and expectations depending on their personality as well as the circumstances of the project. Likewise, it demonstrates why it can be difficult for a supervisor to find the right level of involvement, especially if a supervisor is responsible for more than one PhD student. Within lab-based research, distinct directives sometimes have to be given to a student, e.g. when demonstrating something in practice and three PhD students would in fact appreciate closer guidance on practical aspects of their lab work. By contrast, a strikingly large number of supervisors wanted their students to gain more independence with regard to experimental design and data analysis which might simply be due to the fact that on-bench supervision takes a lot of time. However, PhD students (and maybe not even the supervisors themselves) might be aware of the fact that this part of supervision is not only time-consuming but also more and more challenging given the pace at which new techniques arise. Frequently, PhD students embark on novel practical methods their supervisors cannot provide sufficient guidance on, which means that supervisors can no longer adopt the supervisory style they experienced as a student. Besides supporting students to complete their lab work and to write their thesis, more help seems required for PhD students to develop those skills which allow them embark on new approaches such as how to choose a research project, how to choose a technique, how to prioritize experiments or how to manage a project.

To identify a student's level of autonomy and to decide how much guidance shall be provided can be quite challenging for a supervisor. Trying to find the balance, supervisors adopt hands-on and hands-off approaches at the same time (Gurr 2001) as well as at different times during the supervision period (Gatfield 2005). Moreover, they vary the kind of support they provide, i.e. intellectual, emotional or structural support (Vilkinas 2008).

Interestingly, these adjustments are made although supervisors do not seem to be capable of reflecting on their own supervisory style (Vilkinas 2008). The discrepancies between the students' and the supervisors' perception of how many ad-hoc meetings they have indicates that it is not even always easy to tell when supervision happens. These apparent difficulties in reflecting upon the supervisory relationship make it attractive to implement tools which enforce such reflection.

In the present survey, the supervisor/student alignment plot (Gurr 2001) was employed to get an impression how supervisory relationships can be perceived by the supervisors on the one hand and the PhD students on the other. A major aim was to investigate how both sides define the autonomous student as direct instructions are frequently required within lab-based research. Half of the students described themselves as less autonomous than stated by their supervisors and at the same time, they believed to get more support than the supervisors thought to have provided recently (Fig. 24.5 B). A possible interpretation is that supervisors overestimate their students' development. Alternatively, the students have already generated more autonomy than they are aware of. This latter assumption is supported by the students' examples of situations in which they would like to be more independent. Instead of mentioning too tight control with regard to practical questions, experimental design or data analysis, the students request more freedom to shape scientific discussions and to interpret their scientific results in a broader context. This indicates a certain level of student autonomy at least in those four cases where the supervisors do not state that their students need too much help with basic, practical problems.

All in all, eight out of ten supervisors believed that they provided less guidance (hands-off) than perceived by the students (Fig. 24.5 A-B). This finding seemingly disagrees with the outcome of a similar study which revealed the exact opposite trend for the majority of the students at the start of the project (Manathunga & Goozée 2007). Later in the supervision period, the supervision style changed towards a more hands-off approach based on the decreasing amount of time spent by the supervisor. The snapshot provided by the present survey may be biased because most of the PhD students were at least in the second year of their projects. Strikingly, no correlation can be observed between the frequency of meetings and the students' ratings of their supervisors' recent style (compare figures 24.4 and 24.5). Close supervision characterized by frequent meetings is thus not necessarily perceived by students as means of taking inadequate control.

Three supervisory relationships were characterized by PhD students who considered themselves as much more independent than the supervisors thought (Fig. 24.5A). At the same time, these students described the recent supervision style as hands-on, while the supervisors stated that they have recently provided rather little guidance. The pattern indicates a potential conflict if the PhD students feel that they encounter a high degree of control while seeing themselves as independent. However, as situations in which they would appreciate to have more freedom, one of the students described scientific discussion not providing enough room for his/her own hypotheses and another wanted to make more autonomous decisions about his/her experimental work. Although comprehensible, this pronounced urge for autonomy could easily interfere with the coordination of other projects in the same working group, agreements made with collaborations partners or similar considerations on the supervisor's side as indicated by several supervisors stating that their PhD students should consult them before initiating or dropping experiments. In the cases of these three pairs of participants, supervisors and PhD students appear to disagree on the PhD student's role. Whereas the students seem to strive after autonomy in a way which is not expected or recognized by their supervisors and want to make decisions beyond their own project, the supervisors define an autonomous student as a student who carries out experiments independently after aligning them with their supervisor ideas and who keeps track of a project largely defined by their supervisor.

## Reflection

Both the PhD students' level of autonomy and the circumstances of PhD projects undergo frequent changes which should be tracked in order to dynamically adjust supervision style. When acting as supervisor for PhD students, I have sometimes found it challenging to be aware of my students' development, especially when I had to fine-tune my own role as PhD student/postdoc at the same time. To give an example, the less time I spend on experimental work myself, the more I depend on my students to identify bottlenecks in technical procedures which also means that it becomes more difficult to tell whether they only need time or in fact additional input to optimize a method or experimental design. The challenge increases, moreover, with an increasing number of PhD students which prompted me to test the supervisor/student alignment model as a potential communication

tool to aid supervisory relationships in the future. Based on the promising outcome of this survey and the positive feedback I received from the participants, I will employ the supervisor/student alignment plot and similar tools to better align my definition of an autonomous student and an efficient supervisor with my students' expectations.

All contributions to this volume can be found at:

[http://www.ind.ku.dk/publikationer/up\\_projekter/2011-4/](http://www.ind.ku.dk/publikationer/up_projekter/2011-4/)

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