

COLLEGIAL LEARNING DURING THE PANDEMIC: REALIZED ACTIVITIES AND LESSONS LEARNT

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ABSTRACT

The CDIO initiative, through its twelve standards, provides a well-structured platform for creating optimal teaching and learning opportunities. While most of the standards focus on students and their learning process, two standards focus on the teachers. While standard 9 centers on enhancing faculty competence in personal and interpersonal skills, product, process, system, and service building skills, as well as disciplinary fundamentals, standard 10 centers on enhancing faculty competence through integrated learning experiences, in using active and experiential learning methods, and in assessing student learning. Recent CDIO papers have indicated that standard 10 is one of the least researched standards.

This paper addresses a challenge that many universities have faced during the pandemic outbreak in the spring of 2020; how to identify and share positive and negative experiences acquired by teachers during the rapid transition from campus to digital education. The paper outlines how standard 10 has been applied on a group level among the teachers at the School of Engineering at Jönköping University. The objective is to demonstrate how a scientifically founded group and collegial learning perspective could increase the focus on standard 10 and its importance to the CDIO platform.

The Covid-19 outbreak led to a transition of pertinent teaching forms and the teachers' pedagogical mindset. The urgent question to many higher education teachers was how to swiftly adapt teaching and learning to the new situation. Hence, the pandemic forced an abrupt transition from campus to online activities, something that affected most teachers. To support this transition, the role of the pedagogical development group (PED) changed from inviting experts to share knowledge, to the group members themselves becoming experts through building competence within digital education. The barriers and difficulties in the transition from campus to online education were identified, and best practices, as well as pedagogical experiences, were shared among the teachers through learning activities, such as online seminars with a particular focus on online teaching and assessment. This also led to the identification of new topics for competence development. Student engagement and online examination forms were identified as primary areas for further competence development, and a team activity was initiated based on previous pedagogical research. This resulted in an increase in the awareness of choosing adequate examination forms to optimize student engagement within a course. Future possible directions within collegial learning at the School of Engineering are also outlined.

KEYWORDS

Collegial learning, Online teaching, Student engagement, Teacher competence development, Teacher team building, Standards: 10

INTRODUCTION

Pedagogical development has been an essential cornerstone of the engineering education at the School of Engineering (JTH) at Jönköping University (JU), Sweden. The focus of this development has been through the CDIO initiative which was recognised through a group from JTH entering the CDIO network in 2006. A permanent group was subsequently formed in 2007, working with the CDIO principles alongside educational development which is known as the Pedagogical Development group (PED group). The PED group consists of teachers as representatives from all of the departments at JTH, as well as the Head of HI EDUCATION whom represents the educational division of the student association at JTH (HI TECH.) The PED group is thus a diversified team with perspectives from a broad range of teachers with different engineering backgrounds, as well as the student representative. The group is chaired by the Quality Coordinator at JTH, but has shared leadership and reports to the Head of Education at JTH. The role of the PED group, until 2020, has been primarily focused on arranging pedagogical activities for the staff through pedagogical seminars with invited speakers from JTH with a focus on engineering education, as well as a yearly conference with pedagogical experts.

The research presented in this paper started with, but did not end with, the direct effects of the breakout of the Covid-19 pandemic in 2020. In common with many higher education institutions, Jönköping University was forced to move most of its education online almost overnight, and to maintain a mix of online and physical education for a considerable timeframe through several waves of changing restrictions.

Two challenges were particularly pertinent during the transition from campus to online teaching which identified as the research problems. The first challenge was becoming more proficient in online teaching as an organisation with an uncertain timeline. The second challenge was how to retain or enable student engagement in a new setting where online education could create barriers to student engagement (Almusaed, Almssad & Rico-Cortéz, 2021). There was an urgent need for pedagogical competence development relating to online education at the individual teacher's level, and a great need for organisational learning. For JTH, however, one way to address the problem was at the team level. The role of the PED group members was transformed from being coordinators inviting and sharing the knowledge of experts, to become the "experts" at department levels themselves. This transition was enabled through teamwork, by sharing expertise and experiences among colleagues both in the PED group and on the faculty level, as well as through activities to strengthen the competence in the PED group regarding student engagement and the role of examination in online teaching.

THEORETICAL BACKGROUND

Teams are a valuable organisational approach in pedagogical development. There are some notable features of teams as a concept that is used in the present paper. A team is often defined as a small number of people who are committed to a common purpose. Teams differ from other forms of working groups because they require both individual and mutual responsibility. The team members have complementary skills and teams generate results through the joint contributions of their members. (Katzenbach & Smith, 2008).

Previous studies have shown that members in professional development teams achieved new pedagogical knowledge, especially by learning new concepts and improving their understanding of known concepts that have been discussed during meetings (Gast, Schilddkamp & van der Veen, 2017). The new knowledge gained would occasionally lead teachers to begin experimenting with new ideas. Splitting the team up into smaller temporary groups to work on separate tasks and bring their results back to the group has been found to be a successful factor in team learning (Gast, Schilddkamp & van der Veen, 2017). In organisational psychology and innovation management, it is often highlighted how team

learning is a cornerstone in organisational learning (Decuyper, Dochy & van den Bossche, 2010).

Three essential team learning behaviors are identified by Decuyper, Dochy & van den Bossche (2010). These are sharing, constructive conflict, and co-construction. Sharing is defined as “the process of communicating knowledge, competencies, opinions, or creative thoughts of one member to other team members, who were not previously aware that these were present in the team”. Constructive conflict is “a conflict or an elaborated discussion that stems from diversity and open communication and leads to further communication and some kind of temporary agreement” (Decuyper, Dochy & van den Bossche, 2010). Co-construction is the process of building new knowledge or modifying an original offer. For a team to succeed, it needs to deal with both understanding and agreement, and there needs to be space for constructive conflict and co-construction to reach shared knowledge (van den Bossche, Gijsselaers, Segers & Kirschner, 2006).

Decuyper, Dochy & van den Bossche (2010) distinguishes between two types of learning processes in teams - basic and facilitating. The basic processes describes what happens when teams learn. They are the essential communicative actions that are necessary for team learning. The facilitating processes includes collectively reflecting on team actions, experimenting with new ways of working, and looking for feedback from people outside of the team. The facilitating processes can give the right direction and focus for the team. For a team to learn effectively, it needs to clarify what are the teams goals and how to reach them (Decuyper, Dochy & van den Bossche, 2010).

The CDIO Standard 10 “Enhancement of Faculty Teaching Competence” is defined as actions that enhance faculty competence in providing; integrated learning experiences, using active experiential learning methods, and assessing student learning.

A literature study identified a research gap that the CDIO standard 10 has only been the focus of very limited research and few published articles (Malmqvist, Hugo, Kjellberg, 2015; Edström, 2017; Meikleham, Hugo, Kamp & Malmqvist, 2018; Malmqvist, Machado, Meikleham & Hugo, 2019). More generally, there is little research performed on the role of permanent teacher teams in individual and organisational learning, especially under rapidly changing conditions. What we present herein represents the learning process of the team, and how the team itself developed its understanding and competence during the first stages of the pandemic. Hence, the purpose of this paper is to demonstrate and analyse how team learning can take place in a fast-changing context.

METHODOLOGY

The purpose of this paper is to demonstrate and analyse how team learning can take place in a fast-changing context. This implies a context of discovery where a significant amount of the problem domain is not yet defined, and where there exists several new elements such as a specialised pedagogical team and time-critical events. Hence, we seek to develop a common understanding rather than testing a predefined problem domain.

To describe the process as it unfolded, as well as the context in which it took place, a case study approach is appropriate. Case studies have been described as a choice of what to study rather than how it is studied (Yin, 2018). Here, the object of study is the PED group and its response to the new demands introduced by the Covid-19 pandemic and the need for online teaching with high student engagement, thus representing a single case study in one organisation. The context of this response is clearly relevant and is included in the case study description. This might be described as an exploratory case, demonstrating a situation of particular interest in itself without extensive prior knowledge (Yin, 2018).

The data in the case study is qualitative, which is particularly relevant where there is a need for “rich data” to uncover meanings and interpretations. The case description is effectively based on two types of qualitative data in combination. First, a set of detailed minutes from the activities of the PED group which have been stored on a shared cloud service throughout the entire period, making it possible to track developments and analyse the effectiveness of the implemented changes over time and reconstruct particular events when necessary. The second type of data relates to the artifacts produced by the group, such as summary presentations and material developed for internal dissemination. Finally, all participants were able to read and reflect on the case description and add their input or corrections.

In 2021, 16 meetings were held that gathered the whole PED group. In addition, meetings were held on April 12-13 with all PED group representatives and the individual heads of departments. An unknown number of smaller meetings also took place with sub-teams that were formed throughout the year for the study and discussion of specific topics, however these will not be discussed here. The majority of meetings were held in a digital format, but two physical meetings took place towards the end of the year. 10 out of the 16 meetings took place in the spring and 6 in the autumn. During spring, the meetings were long, covering up to four hours. Considerable time was therefore devoted to PED group activities during the spring as a means for the group members to get to know one another and to work with the topics discussed.

CASE STUDY

“Confidence through competence” – the new way of working in 2021

The work conducted by the PED group used to be oriented towards inviting subject experts to various activities offered to staff at JTH, such as seminars. The PED group had an important role in promoting pedagogical development at JTH, but it was indirect as the PED group members mainly engaged in the practicalities linked to organising activities which hosted invited experts. Starting in 2021, the PED group instead started a journey towards becoming experts in the field of pedagogical development, starting with the topic of digital education. An overview of the PED Group actions in the learning process is presented in Figure 1.

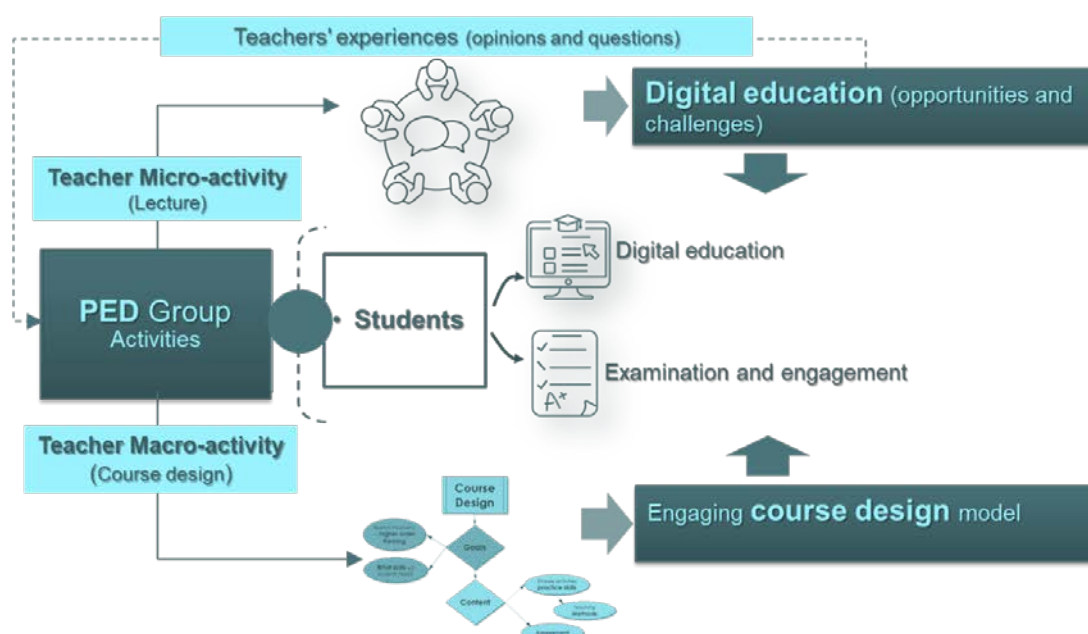


Figure 1: PED Group activities in a crisis environment

In line with CDIO standard 10 that discusses integrated learning experiences, the PED group aimed to build competence by studying literature and performing research within digital education.

Instead of *inviting* experts, the PED group started the journey towards *becoming* experts. Within the PED group, the members spoke of gaining the confidence needed to be able to assist colleagues in pedagogical matters through competence development, *confidence through competence*. This deliberate seeking of new knowledge is referred to as “primary” team learning by Decuyper, Dochy & van den Bossche (2010, p. 120), and was an essential characteristic of the PED group work in 2021.

The PED group functions through all members being active and taking responsibility. In order to address the challenges during this time, several activities were combined to achieve rapid competence development in a team environment. These activities include:

Study of information on digital education

The first activity was to study the information on digital education which already existed at the Jönköping University (JU) level. The PED group divided itself into sub-teams that reviewed different sections of the available information on JU’s intranet, discussed them in the sub-teams, and then convened and discussed them with the whole PED group (meeting notes February 3). The same method of studying in sub-teams, as well as in the full group, was repeated throughout spring (meeting notes February 24, March 11).

Study of examination and engagement

The topic of examination was highlighted as a specific area of interest at the beginning of the year (meeting notes February 24). A few months later, examination was again discussed together with the topic of student engagement, and the same procedure was used as reported in the previous section with sub-teams in charge of studying the two topics (meeting notes April 13). The findings of the two sub-teams were presented to the whole PED group, followed by group discussions. The literature studied in relation to engagement was presented for the benefit of all PED group members (meeting notes May 3). The workflow is presented in Figure 2.

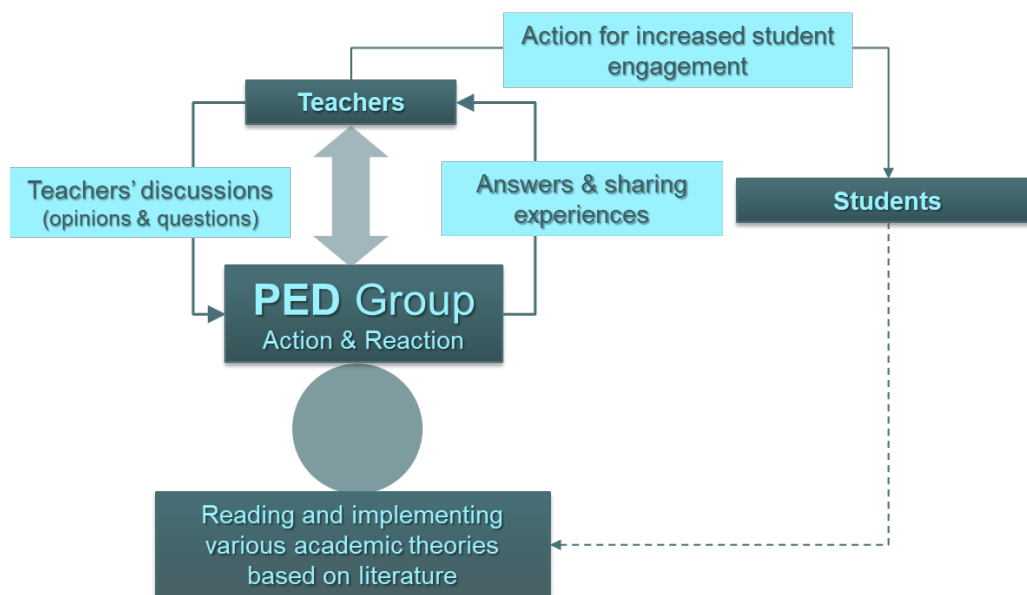


Figure 2: PED Group actions and discussions

Reaching out to colleagues to seek input on challenges linked to digital education.

An idea from one PED group member was for each member to reach out to colleagues in their respective departments to learn about challenges they had faced linked to digital education through a simple survey. The whole PED group was very favorable to the idea which was pursued, and findings were subsequently discussed and analysed (meeting notes March 11, March 23, May 26). It was apparent that a lot of the challenges perceived by teacher colleagues were linked to the lack of engagement among students.

Establishment of a commonly produced model for engaging course design

Towards the end of the spring, the meeting notes describe a shared view of main concepts regarded by the PED group as particularly important to provide engaging education (meeting notes May 26). One PED group member suggested that the group make a “visualisation” of the main concepts and showed an example of what such a visualisation could look like. The visualisation was further developed based on comments from the whole PED group during the same meeting. It became apparent to the PED group that the model did not only cover digital education, but was sufficiently broad that it also reflected on campus and blended education (June 15). The model is presented in Figure 3.

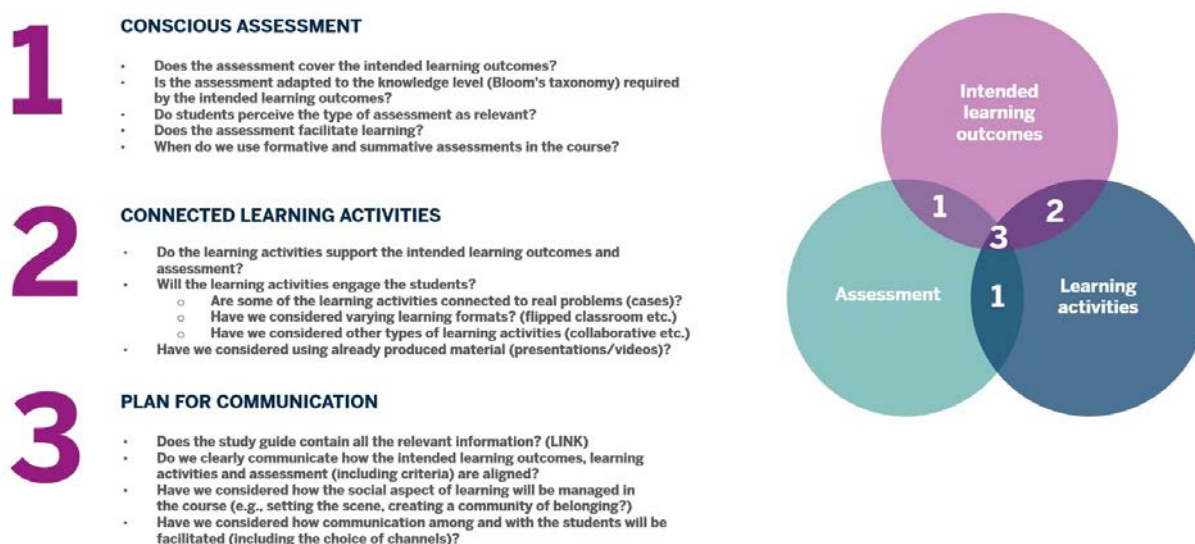


Figure 3: Model for course design for digital and campus education

Reaching out to the departments and engaging in department meetings

During the spring, meetings took place that mixed departments to ensure that PED group members might learn about activities in another department and about the expectations of the heads of departments. PED group members met with teachers and programme managers in different fields to provide and receive feedback related to the survey, which took place throughout the autumn.

Preparations for the CDIO article

While the idea of writing an article for the CDIO international conference in 2022 was first discussed with suggestions for topics presented during the spring (meeting notes March 23, May 26), it was not until the autumn that preparations were made by the whole group. As a result of this work, the PED group has gained relevant knowledge related to pedagogical development at higher educational institutions, e.g., the lack of research in the CDIO

community in relation to faculty development and how the work of the PED group may be presented as a model for team learning.

ANALYSIS AND FINDINGS

To analyse the PED group activities described above, the team learning processes as described in Decuyper, Dochy & van den Bossche (2010) are used: basic team learning processes and facilitating processes. Basic processes are divided into sharing, constructive conflict, and co-construction, while facilitating processes are divided into team reflexivity, team activity and boundary crossing. The authors claim that their model “describes what teams do when they learn” (Decuyper, Dochy & van den Bossche, 2010, p. 116). Using their model is therefore a way of analysing the PED group activities and a test of the model itself.

Basic processes

Sharing: As shown in the activities section above, the PED group members shared their ideas about different topics and complemented each other coming from different backgrounds. As mentioned by other scholars, psychological safety is essential for team learning (see, e.g., Vangrieken, Docht & Raes, 2016) so that all members feel free to express their opinions. For most activities that took place, the element of sharing was prominent. The meeting notes repeatedly described discussions around different topics, often following the division into sub-teams and discussions and preparations. New knowledge was thus acquired by the PED group members through shared knowledge, by sharing of thoughts and ideas and ensuing discussions and adjustments to previous suggestions.

Constructive conflict: The team learning process constructive conflict is also easily identifiable in the material as described above, understanding the definition as respectful negotiating and listening to one another. This was key to identify the critical new knowledge required to achieve the goals during the rapid-changing environment. The material shows several examples of discussions and negotiations taking place, allowing the PED group to reach a deeper understanding of complex issues and arrive at shared knowledge. For instance, work in relation to the model was preceded by discussion and negotiations leading up to the model described in Figure 1.

Co-construction: The co-construction processes includes all of the discussions and negotiations that took place and that led to shared knowledge. The PED group meetings were productive and led to shared knowledge both in relation to digital education but also to campus education and to team learning in general. Co-constructed knowledge related to digital and campus education is exemplified by the model for course design in Figure 1, while co-constructed knowledge related to team learning is provided in this CDIO article.

Facilitating processes

Team reflexivity: The meeting minutes show several examples of team reflexivity. One important example was the realisation within the group that further competence development within examination and assessment was needed, resulting in additional studies of these topics. Another example of team reflexivity is the gradual realisation that the jointly shared knowledge covered not only digital education but also campus and blended education.

Team activity: In addition to communicative activities that have been reported in the previous section, team activity in the form of *experimentation* (Decuyper, Dochy & van den Bossche, 2010) has also occurred. An exciting discovery was how two PED group members had made similar changes to their examination forms independently of one another based upon the acquired shared knowledge. It was possible to track the changed practice to the primary learning that had taken place in the group and to observe that the change was well received by the students, as identified by the positive increase in engagement by the teachers and

subsequently shown in the course evaluations. Naturally, ongoing evaluations over a longer period are required and will be studied to track the long term response from students and teachers from any implemented changes. Relating (positive) output to a particular input is often difficult, but in this case, the relation between output and input could be clearly identified.

Boundary crossing: Structurally, the PED group crosses boundaries as it consists of members representing the different departments at JTH. In the PED group meetings, representatives of different department cultures and practices convene for joint discussions and reflections. In addition to this structural boundary crossing, the meetings with two departments simultaneously, and visits by two PED members to the department of one of the members, are other examples of such boundary crossing. In these instances, boundary crossing has occurred through a PED group member getting a glimpse of the culture and knowledge of another department.

DISCUSSION

In summary, we believe that the model for team learning by Decuyper, Dochy & van den Bossche (2010) has been useful and has helped the members of the PED group identify and structure the type of learning that has taken place. Identifying, however, that the label *constructive conflict* does not adequately describe the negotiations that took place. Instead, we would like to propose the label *constructive compromise*.

The results from the new way of working in 2021 has led to a number of changes within the organisational operation of the PED group, as well as the outcomes. The key actions that led to these outcomes can be identified as follows. The PED group set out to increase the competence of its individual members on the topic digital education. This goal was reached. The PED group members felt greater confidence in providing help to colleagues in this field than previously, although continued competence development should continue. What is noticeable is that several results were reached that were not initially identified as goals but have, nevertheless, been produced. These results include competence development covering not only digital education, but also campus and blended education, the co-construction of the model for course design for digital and campus education, and changes of practice. The work with the CDIO article has also produced knowledge in the group on its capacity for team learning, as well as an artifact on the same topic in the form of this article.

Finally, we believe that three factors in particular have contributed to the PED group reaching the goals and the non-intended results mentioned above. These factors are *primary team learning*, *organisational aspects*, and *shared leadership*. The focus on *primary team learning* is the most specific change of the work of the PED group in 2021 as compared to previous years. The fact that all members studied the same topic meant that they got a common language and mindset about highly complex issues. This, in turn, led to the development of homogeneous knowledge in the group in several areas, as discussed here. The second important factor is related to the *organisational aspects* of the PED group. Funding and support from management, and the habit of the whole PED group to meet every two to four weeks for joint discussions have been in place for several years. This means that the PED group has developed into an arena for discussions on pedagogical development (see e.g., Roxå, Mårtensson & Alveteg, 2011). The third factor we believe to be of importance is *shared leadership*. As discussed by several scholars, shared leadership is of great importance for team learning (Decuyper, Dochy & van den Bossche, 2010, pp. 125-126; Koeslag-Kreunen, van der Klink, van den Bossche & Gijssels, 2017 p. 196; Roxå & Mårtensson, 2015). Shared leadership relates to leadership taking place among, and stemming from, the members. As the team members in this way take responsibility and decide on activities, results and decisions

will have a robustness to them, increasing the likelihood of being implemented and therefore contributing to organisational change.

CONCLUSIONS

Our case study has shown how teams can be used to facilitate competence development in rapidly changing environments. The formulation of the purpose is rather general, but our natural focus is on pedagogical development which sharpens the study. While the case study is of a single group in one organization which could produce different results elsewhere, the model from Decuyper, Dochy & van den Bossche (2010) was very helpful in structuring the discussion and appropriate as a basis for analysis. Further, we show a model for how competence development can take place, which should also have relevance for other higher education institutions. The use of more permanent teams, as demonstrated in the paper, could be a complement to pedagogical centres for teaching and learning which are necessarily more resource demanding. For the members of the PED group it has been very interesting to see how the work represented through numerous meetings and smaller tasks can be framed in terms of competence development and contribution to the organisation.

There are numerous interesting avenues for further research. One is temporal – the team presented in this study was very well established and there is an inherent assumption that this was an advantage due to organisational memory and existing ways of working, but it is possible that younger teams can have a similar effect on learning if the management support is sufficient. The team composition is an important element – the representativeness in terms of different departments can be explored in terms of the nature of the team itself and how more focused teams perform. The level of learning – that is the micro, macro and meso of the organisation could be explored in several ways since the focus here has been on the team itself. Finally it would be of great interest to see the consequences of this type of team learning for the organisation itself in the longer run, and the success will be evaluated through teacher and student evaluations.

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REFERENCES

- Almusaed, A., Almssad, A., & Rico-Cortéz, M. (2021). Improvement of student engagement in a digital higheducation environment during the Covid-19 outbreak. *Online Education during the COVID-19 Pandemic: Issues, Benefits, Challenges, and Strategies*, 99-140.
- Decuyper, S., Dochy, F., & van den Bossche, P. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organisations. *Educational Research Review*, 5(2), 111-133.
- Edström, K. (2017). *Exploring the dual nature of engineering education: Opportunities and challenges in integrating the academic and professional aspects in the curriculum*. Dissertation, Stockholm: Royal Institute of Technology (KTH).
- Gast, I., Schilddkamp K., & van deer Veen, J. T. (2017). Team-based professional development interventions in higher education: A systematic review. *Review of Educational Research*, 87(4), 736-767.
- Katzenbach, J. R., & Smith, D. K. (2008). *The discipline of teams*. Harvard Business Press.

- Koeslag-Kreunen, M., van der Klink, M., van den Bossche, P. & Gijsselaers, W. (2017). Leadership for team learning. The case of university teacher teams. *Higher Education*, 75(2), 91-207.
- Malmqvist, J., Hugo, R. & Kjellberg, M. (2015). A survey of CDIO implementation globally – Effects on educational quality. *Proceedings of the 11th International CDIO Conference*, 12, 1-17.
- Malmqvist, J., Machado, T., Meikleham, A. & Hugo, R. (2019). Bibliographic data analysis of CDIO conference papers from 2005-2018. *Proceedings of the 15th International CDIO Conference*, 816-833.
- Meikleham, A., Hugo, R., Kamp, A. & Malmqvist, J. (2018). Visualizing 17 years of CDIO influence via bibliometric data analysis. *Proceedings of the 14th International CDIO Conference*, 53-72.
- Roxå, T., Mårtensson, K. & Alveteg, M. (2011). Understanding and influencing teaching and learning cultures at university: A network approach. *Higher Education*, 62(1), 99-111.
- Roxå, T. & Mårtensson, K. (2015). Microcultures and informal learning: A heuristic guiding analysis of conditions for informal learning in local higher education workplaces. *The International Journal for Academic Development*, 20(2), 193-205.
- van den Bossche, P., Gijsselaers, W. H., Segers, M., Kirschner, P. A. (2006). Social and cognitive factors driving teamwork in collaborative learning environments: Team learning beliefs and behaviors. *Small Group Research*, 37, 490-521.
- Vangrieken, K., Dochy, F. & Raes, E. (2016). Team learning in teacher teams: Team entitativity as a bridge between teams-in-theory and teams-in-practice. *European Journal of Psychology of Education*, 31(3), 275–298.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed). London: Sage.

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