



# To Become Digitally Competent: A Study of Educators' Participation in Professional Learning

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**Abstract.** Digital competence has become a concept that gradually has been addressed in classroom practices as well as in policy documents. This is due to educational reforms regarding the digitisation of educational practices. How, then, can teachers make sense of these changes putting pressure on improved quality of their educational outcomes? The paper informs of a work-in-progress paper, which aims to shed light over how teachers in preschools and schools participated in professional learning to become digital competent. The overall research question addresses how teachers can be supported in their professional learning and digital technology integration through an action research approach, in particular inspired by Schön's perspective on designing and learning, focusing on the initial design process. We investigated teachers' tensions and sensemaking strategies regarding integration of digital technology in their educational practice through a model of participation, involvement, and responsibility (DIA model). Methodically, the paper is based on outcomes from two baseline questionnaires. The results unfold the importance of a context-conscious leadership as well as promoting team learning and collaboration between teams to create dynamics between the teachers.

**Keywords:** Digital competence · Teachers · Preschool · School · Professional learning · Participation · Involvement

## 1 Introduction

Digital competence has become a concept that gradually has been addressed in classroom practices as well as in policy documents: the term has also been subject for definition in the academic field. Recent updates to the curriculums of both preschools and schools in Sweden underline that education should contribute to students' ability to act in an

increased digitised society and develop their skills to use digital technology in their everyday lives [1–3]. Aligned is how the European framework for the digital competence of educators, which acknowledges that teaching professions face rapidly changing demands, which requires a broader set of competences than previously. This framework provides guidelines for teachers at all curriculum levels including adult education. The framework highlights educator-specific digital competences organised in different areas. For example within professional interactions with colleagues, to managing the use of digital technologies in teaching and learning activities, and specific pedagogic competences required to facilitate students' digital competence [4]. This paper presents ongoing work attempting to address the overall question of how teachers in preschools and schools perceive their digital competence and how they consider their opportunities to improve their competences. An action research approach is taken inspired by Schön [9, 10].

## 2 Background

Reforms and policy documents cohere to changes in political, social, and educational practices that place increased pressure on preschools and schools to improve the quality of their educational outcomes [5]; in this case related to teachers' competence to integrate digital tools within teaching and learning activities. Researches underline that changes in educational practices highly depend on teachers' capacity to change their understandings and teaching repertoire [c.f. 6]. However, educational reforms are not simply a matter of teachers' willingness to apply new ways of acting or having access to digital tools, it is a multidimensional process of change including both a teacher's mindset as well as pedagogical dispositions informing new teaching strategies [c.f. 4]. This evokes questions of how teachers can make sense of current complex demands on enhancing their digital competence to improve technological integration in their classroom settings. As Phelps et al. [7] state, educational change should consider diverse needs of all teachers and avoid limiting approaches that often replicate existing historical and cultural practices in schools. The latter includes a risk of assimilating, or domesticating [8] traditional teaching approaches. Thus, it is crucial to apply a classroom-based authentic and contextualised approach to teachers' development of digital competence.

Schön [9, 10] emphasises that designing and learning are closely coupled forms of inquiry. From this point of view, a design process opens up possibilities for reflection as well as surprise that can trigger new ways of seeing things, and it demands commitments to choices revealing underlying values, assumptions, and models of phenomena.

The present study includes 21 preschool teachers and 16 primary school teachers in a school district in southwest of Sweden and is part of an ongoing project, Digi-DIA. The project focuses on developing students' and teachers' digital competence through participation, influence, and responsibility, conceptualised as the DIA-model<sup>1</sup>. Conceptually, this means that we do not apply top-down designed in-service training events to develop teachers' skills or other characteristics of a teacher [11]. Rather, the acts of professional learning can be explained as a bottom-up self-directed approach to professional needs or

<sup>1</sup> DIA stands for *Participation, Influence, Responsibility* and is a model developed by Tony Roth, Principal at Harplinge-Steninge Schools in Halmstad, Sweden.

interests, which are part of the pedagogical work that the participating teachers undertake daily in their classrooms. Raphael et al. [12] conceptualise professional learning as “ownership over compliance, conversation over transmission, deep understanding over enacting rules and routines, and goal-directed activity over content coverage” (p. 147). Thus, based on the above-mentioned overall question on how teachers in preschools and schools perceive their digital competence and how they consider their opportunities to improve their competences, this paper reports on a work-in-progress particularly focuses on the project's initial design process investigating teachers' tensions and sensemaking approaches regarding integration of digital technology in their educational practice.

### 3 Perspective on Professional Learning and Development

Designing a professional learning approach to developing digital competence can be compared to what Sanders and Stappers [13] conceptualise as a *complex and tangled nature of problem solving with a fuzzy front end*. Aligned is Rittel and Webber's [14] conceptualisation of a *wicked problem as a social phenomenon combining complexity, uncertainty and competing goals such that it challenges commitment*. The previous mentioned DIA model (Participation, Influence and Responsibility) gives both students and teachers a real influence on working methods and the content of teaching. It takes a holistic approach to the mission of preschools and schools to follow the intentions of the curriculum and at the same time secure quality of the education. While applying the DIA model, teachers systematically evaluate their own actions and leadership when interacting with the students. Through the DIA model, professional learning is considered as a synthesis of teachers' leadership in the classroom, their experiences, co-creation, and knowledge. All in all, this targets a development of the teacher profession as well as of the organisation.

The DIA model is anchored in the preschool and school organisation through a specific local organisational structure, the Council for Development and Innovative Thinking. This structure includes eight representatives from different parts of the organisation: the principal for the preschools, the principal for the schools, the school health representative, two representatives from the preschool, and three representatives from the school. This council is a crucial organisational entity ensuring transparency as well as a bottom-up perspective encapsulated and aligned with the model. The council meets every third week and is responsible for dealing with needs and thoughts from the co-workers, keeping an overview and monitoring pedagogical and policy issues, and, based on this, giving feedback to the co-worker teams. The organisation of the Digi-DIA project reflects the above-described model, where the project management includes the council's two principles as well as two representatives from the preschool and school context.

### 4 Sensemaking in a Problem Space

Participation in professional learning from a DIA perspective requires mutually constituting processes. Focusing on participation with other people, Dewey [15, p. 16] provides the following account:

“The social environment /.../is truly educative in its effects in the degree in which an individual shares or participates in some conjoint activity. By doing his share in the associated activity, the individual appropriates the purpose which actuates it, becomes familiar with its methods and subject matters, acquires needed skill, and is saturated with its emotional spirit.”

Such conjoint processes can serve as mutual sensemaking between participants in a team or cross-over teams. In the case of Digi-DIA, the participants experienced tensions in not having enough space to jointly make sense of the issue of applying different digital tools in teaching and learning activities. These tensions between the teachers’ attempts to make sense of a situation and at the same time experiencing frustrations could be analogised with Simon’s [16] picture of designing as search within a problem space. In the context of this study, the problem space concerns a search between what is unfamiliar and what is already known.

#### 4.1 Sensemaking as a Space for Professional Learning

Educational practices can be considered complex social systems, which as such includes uncertainty and instability [17, 18]. When individuals meet situations that are ambiguous, they engage in sensemaking trying to create meaning by, for example, trying out different ways of approaching a new situation [19]. In this way, sensemaking processes are social, intersubjective, and based on a context of norms, values, concepts, and habits [20, 21]. Rikkerink et al. [21] introduces a theoretical framework connecting domains involved in the practical use and making sense of digital learning technologies by teachers: Leadership, Context, Teacher characteristic, and Teacher learning. The authors state that when approaching professional learning it is necessary to assume that it is embedded in a complex and reciprocal interaction between these four domains.

In the present study, teachers were actively involved in such sensemaking processes, including iterative reflections on their teaching and learning practice [c.f. 10]. Howard et al. [22] point to how previous research regarding technology integration in educational practices primarily has focused on factors of teachers’ practice. In particular, teachers’ level of confidence with and knowledge of digital technologies. Furthermore, they posit how school leaders’ guide teachers in their use of digital technology to improve technology integration. However, only minimal improvements in cultivating an integration of digital technology in teaching and learning have been noticed [c.f. 23]. So, how can these *complex and wicked problems* of technology integration be improved? Howard et al. [22] conceptualise processes of sensemaking as a space for teachers to identify where they may want or need support. To support this, school leaders should develop a culture of experimentation and learning to encourage teachers’ use of digital technology in their teaching and learning activities [23]. Thus, an understanding of the contextual setting of teacher learning and technology integration is necessary. Drawing on the concept of sensemaking, we designed and performed a baseline questionnaire study by the start of the project and the same questionnaire was repeated 16 months afterwards. This paper reports on a work-in-progress and is based upon the outcomes of these questionnaires. The project as a whole also include interviews, workshops, casual conversations, and observations. As this data collection progresses, outcomes will be reported in later publications.

## 5 Method

The study includes nine preschool units (including children 1–5 years of age) and two schools with 10 school units (including children between 6–11 years of age) in a municipality situated in the southwest of Sweden. In total, 21 preschool teachers and 16 primary school teachers participated in the study.

The method used in this paper was two baseline questionnaires to investigate how teachers experienced their own competence regarding integration of digital technology in their educational practices. The questionnaires were distributed in February 2018 and the following one in June 2019. The first one intended to create a 'current state' of the teachers' use of digital technology in their teaching activities. The second questionnaire targeted a description of the 'new state' of the teachers' use of digital technology in their teaching activities. The teachers had designated time during their working hours to fill in the questionnaire. The questionnaire consisted of 33 questions, which on average took 20 min to complete. In the present paper, only the questions that concerned how the teachers in the preschools and schools perceived their digital competence and how they considered their opportunities to improve their competences are analysed. The questionnaire and the questions included are described in the next section.

### 5.1 The Questionnaire

The questionnaire consisted of 33 questions divided into seven themes:

1. Background information;
2. Teacher's experience of using digital tools together with the children;
3. The teacher's digital competence;
4. Digitisation and the DIA-perspective;
5. Digitisation and collaboration with parents;
6. Digitisation and the physical environment;
7. Digitisation and knowledge sharing with colleagues.

The themes included in the present study were: 2, 3, 7, and parts of theme 4. Theme 1 was only used to check how many teachers that responded and which school context they represented (preschool or primary school). Each theme included more than one question and with each having differing answers to select from, as in a Likert scale (e.g. "positive, negative, not used"; "very good; good; less good; not good at all" and "not at all; to a less degree; to some degree; to a great degree") [24]. For example, the question about the teacher's digital competence included questions about how the teacher estimated his/her current digital competence, what skills were needed to use digital tools, what motivation was needed to contribute to the digital development, and which support the teacher would need to become a competent user of digital tools in teaching activities.

When it comes to theme 4, we have only included one of the questions related to the open question about the teacher's experience of having or not having enough skills and competence to include the children in digital activities applying the DIA-perspective. Theme 7 included two questions where the teacher was asked to estimate time and space

available for collegial knowledge sharing and whether the teacher experienced enough time for own digital competence development.

The teachers were informed that their answers were anonymous and that their names were coded and only identifiable by the researchers and, thereby, not accessible or trackable by their leaders.

## 6 Analysis

The collected quantitative data from the two questionnaires (carried out 2018 and 2019 respectively) underwent a simple statistical analysis visualising the material and identifying directional indicators to illustrate potential changes between the first and second questionnaire. The open answers were analysed qualitatively by a coding strategy where we carefully looked through the written and elaborated text answers, identified themes (e.g. in terms of opportunities and/or challenges). Next step was to code these themes, which then evolved through merging them into broader sets of themes [c.f. 25]. Through this quantitative and qualitative approach, we identified three overall themes: (1) Shared comprehensive influence; (2) Reconstitution of space and time for shared learning, and (3) Providing tools to mediate professional learning. These themes are elaborated in the below text.

### 6.1 Shared Comprehensive Influence

The teachers' experiences of using a number of digital tools together with the children in teaching activities changed between the first and second questionnaire. Teachers' experiences of using tools like digital camera, computer, digital microscope, TV screen, 3D printer, Chromebooks and mobile phone did not change. For example, while 3D printer and digital microscopes was still not used, mobile phones, Chromebook, and computers were experienced positively to the same extent between the first and second questionnaire. In the open writing parts of the questionnaires there were no negative responses. A teacher from one of the primary schools expresses her positive experience of using the computer for children's learning of writing as well as being able to not only use a pen when writing, but combining different modalities when using a computer.

[Computers are] increasing [pupils'] motivation, the pupils quickly understand, they are used to use digital tools from home, [the pupils] can use images and sound and other digital tools on the computer, [computers] can ease their writing acquisition (not necessary to all the time use pencils to write), [I] can adapt the teaching for pupils with difficulties.

To have an own Chromebook is a great inspiration for the pupils.

Preschool teachers emphasise that digital tools, such as computers, digital camera and mobile phones, enhance children's participation and engagement by, for example, enabling immediate finding of information on children's questions.

[It is] positive to being able to catch moments in the children's everyday lives with, for example, the mobile phone. To document with mobile phones. It has a positive effect, children can participate [in the documentation].

The second questionnaire showed a slight increase (on average 6%) in teachers' use and documented positive experiences in regards to iPads, Cleverboards, and projectors. Also, in the open writing parts of the questionnaires there were no negative responses. In the open writing parts, projectors were in particular noted with several positive comments from the preschool teachers pointing towards specific engaging, participative, and pedagogical qualities.

They [The children] think it is exciting to test new things and to learn more. They think it is fun with digital tools. Many of the digital tools are easy to use together with many children, for example by the projector where several children can watch at the same time. They can watch together and learn from each other.

It is easy to show fairy tales and movies [with the projector]. This results in that the children directly can see a result of what is said, which is positive. The projector enables the children to, together with their friends, learn in a social context. We want to develop this further.

Regarding iPads, the teachers put forward their information finding qualities and how they contributed to more movements and reflection among the children.

iPads can capture many children when using them for singing and movement from YouTube recordings of popular songs. The children do not need to sit still to concentrate, but can move to the music.

Via pictures and videos documented with the iPad, the children can reflect upon their doings.

Cleverboards had more general comments, such as that they offer clarity when going through subject topics, which create a better overview, understanding and interplay among the pupils.

The biggest change in the experience of using digital technologies relates to programmable robots such as Beebots, Bluebots, and Ozobots. The second questionnaire showed an increased positive experience of using Beebots/Bluebots by 16% and an increased use of other programmable robots (which in this case relates to the Ozobot and Mindstorm robots) with 17%.

The Beebots have really captured the children's attention, they are very curious and want to work with them.

The children enjoy testing the Beebots and Bluebots.

Beside this increase, some teachers introduced new tools, such as Osmo in school classes and Tapioca in preschool units, between the first and second questionnaire.

I have positive experiences [of digital tools]. Osmo has stimulated learning in math. It combines iPads with concrete material [e.g. wooden bricks].

These specific increases in some of the teachers' use of programmable robots and introduction of new tools to their digital teaching repertoire, can be related to their interest in sharing knowledge and experiences with the researchers. This led to that the researchers could contribute with framed input and suggestions related to the teachers' interests regarding the context of use, e.g. pedagogical goal, topic or subject of teaching, or children's age and experiences in programming.

We also noted a change in the kind of open answers/comments to this specific question between the two questionnaire investigations. Compared to the first questionnaire, the second one included more precise comments related to specific digital tools and their pedagogical qualities and values when applied in teaching and learning activities. In particular, the new tools (robots, Osmo, Tapioca) as well as the projector and Cleverboard were commented on. The comments concerned how they contributed to *concrete*, *collaborative*, and *participative* pedagogical qualities and values when integrated in teaching and learning activities.

I have mostly seen positive effects, for example when, together with the children, working with Beebot, Ozobot, or Tapioca, it becomes a collaborative learning activity evoking children's curiosity as they can contribute with and have different ideas about what the tool can be used for.

[The children] try them out, explore different solutions, present results in different ways, solve problems together with others, argue, discuss and bring ideas forward, take part of thoughts from others, questioning, become interested and joyfully learn.

To conclude this theme, the second questionnaire showed that the teachers' use of digital tools in their teaching activities was characterised by shared exploration together with the children. This created *comprehensive learning* experiences where both teachers and children contributed and could *influence* learning processes in the situation.

## 6.2 Reconstitution of Space and Time for Shared Learning

In the second questionnaire 73% of the teachers experienced a good or very good digital competence as well as skills in using digital tools and services in their teaching activities. This value was 10% higher compared to the first questionnaire study. However, while experiencing having a good or very good digital competence and skills in using digital tools, the teachers, in the open answering/commenting space, clearly asked for more time



and opportunities for sharing knowledge with colleagues, or learning from each other. In line with Dewey [15], this was an expression not only to learn or to improve skills, but also to nurture and further develop their acquired skills and competences within an *educative social environment*.

I wish support from a colleague that has more knowledge than I have.

I am interested in and think it is fun to work with, for example, iPads, Beebots, and projectors as part of my teaching. This is motivating. However, it is very helpful to work together with colleagues who share the same or have more interest in digital tools. We would inspire each other.

I do not have the time to develop or deepen my skills. [ ] miss colleagues to plan and discuss with.

While these quotes reveal the teachers' promotion of spaces for collegial support and sharing of knowledge, they also seem to state that there also is a lack of such interaction. In this space, the individual teacher could orientate towards a common object (improved digital skills and competence), which became a resource for the collective group of teachers (co-workers) to reflect on and learn from. In this regard, the 'doings' with different digital tools were emphasised. Several of the teachers emphasised that the collegial nature of knowledge sharing and support was crucial to bring about teachers as competent users of digital tools in teaching and learning activities, and for such tools to become an integral part of the work culture.

I want to have more collaboration with my colleagues. To test and use [digital tools] is a good learning method, in particular while doing it together with colleagues.

I need to learn more about the tools, how they work, if I shall use them among the children.

Regarding this theme, the second questionnaire also showed that teachers explored and learned qualities of digital tools together with the children. A number of the teachers noted a necessity to have courage to, as teacher, let the 'being in control' go away, when it comes to having time to develop digital skills and competence.

It is good to have possibilities to lend digital tools (as we did at the X preschool) and together with the children test and challenge myself to use them during a longer time span.

Increase my competence in additional ways of using iPads, where children and teachers jointly participate.

A clear difference between the first and second questionnaire related to the time the teachers experienced they had available for planning for inclusion of digital tools in

their teaching activities as well as for individual professional learning. While the first questionnaire showed that the teachers considered that they had enough time for this, the second questionnaire showed that they considered that they did not have enough time for this. This can probably be explained by the teachers' increased knowledge about new digital tools and, at the same time, experienced that they did not have time enough to explore them.

In the first questionnaire, several teachers noted practical and technical problems with the digital tools, for example if an iPad was uncharged when it should be used in a teaching situation, led to loss of valuable time and as was stressful.

I believe that I myself have to see the benefits with using digital tools and continuously transfer this to my practice together with the children and, then, evaluate what continuously can become better. I think that an uncharged iPad creates resistance to use them, limits the learning capacity. Updates and other issues should just work. If these components do not work, we will not use them. Time to keep up with problems creates stress and irritation.

In the second questionnaire, there were less comments like this, rather comments like the above-mentioned collegial and child-centred aspects were more frequently noted. Moreover, these collegial matters were related to notes about the importance of an individual investment of efforts and an acknowledgement from the leadership of getting time to explore and learn.

One can never become too competent. Development happens all the time. For me it is about being curious and keep up with the development and getting some time to test and experiment.

The fact is that when new tools or tasks are introduced, most often they come from 'above'. The leaders should give time to this; to get acquainted, to plan, and to learn.

When relating this quote to the teachers' professional learning to become digital competent, this is considered as taking place through relationships that enable or prevent professional learning. We argue for a need of reconstituting both space and time in order to promote both for teachers' shared learning, as well as for organisational learning. Here, the DIA-approach (participation, influence, responsibility, see Sect. 3) could be a vital factor.

### 6.3 Providing Tools to Mediate Professional Learning

A red thread is necessary, a holistic view between colleagues regarding how and what [digital tools] we shall use. The overall goal with this digitisation needs to be clarified by the leadership as well as they need to make

time available and create practical and economic conditions for us to be able to work more digitally. More directions from the leadership and the leaders how we shall work and to what goal. This has to be more conveniently manageable in our everyday work.

Vygotsky [26] emphasises that learning by mediation happens when people use symbolic tools to regulate their activity. In the present context, it is significant that the teachers, by the second questionnaire, are ready for implementing digital tools and to professionally learn more about such tools and how to pedagogically use them. However, the teachers express a need for a clear and holistically considered direction from the leaders, including time, and space for the teachers to become professionally more competent. While some teachers find it complicated to develop their own and the children's digital skills and competence through the DIA approach, some teachers acknowledge it as a holistic tool, which, though complex, can assist a pedagogical dimension to implementing digital tools in teaching and learning activities.

The DIA-model as a tool is good as one gets a holistic picture, one can catch up by looking at old DIA plans and learn from them. However, the DIA tool is quite comprehensive with many parts. It [the DIA model] should be possible to make it easier to work with and to be able to work with it more flexible, for example bringing in the digital learning.

Other examples are:

I think the DIA model is an excellent tool to include children's participation, influence and responsibility in any learning activity.

The DIA model could be complicated. Co-workers have difficulties in understanding how they should be done. We seldom get feedback or help for development.

I experience that I have competence to use the DIA model. We help each other within the working team. However, it is never wrong to improve things now and then.

Vygotsky [26] clarifies that people engage in joint activity to pursue a goal. The ways people act and express themselves to the functions or limitations of a tool that they use. From this point of view, the transmission of knowledge among, for example, a team of teachers can be understood by socially constructed capacities and knowledge acquisition, which is an outcome of the interaction with tools. The concept of tools can be understood as the digital tools that teachers use, but here they refer to the overarching DIA model as a tool to support professional learning when it comes to professional use of digital tools in teaching and learning activities. As such the DIA model offers a pedagogical tool with practical qualities as it can act as a framework for the planning

and documentation of teaching and learning activities. Designating a pedagogical tool like the DIA model implies that the users of it embrace a degree of direction and, at the same time a degree of discretion in the way of planning and documenting. It is, however, important to clarify that, according to Leont'ev [27] tools are not just physical artefacts as they incorporate a social utilisation structure. In the context of the present study, this means that the utilisation aspect of the DIA model explains an organisational culture rather than the physical artefact. This is revealed in the open answers/comments of both questionnaires, indicating that the DIA model, as a tool for professional learning, offers not only physical operations but also acts as a framework of a work culture characterised by a holistic view on collaborative learning and development.

The model is very good as it starts from the children's perspective and puts participation, influence, and responsibility at the core. The children can contribute to the activities, discuss and share their experiences, experience participation.

The model contributes to a sense of community. By starting from the children's interest and needs, it is also possible to create a greater engagement. To participate in the whole process [planning, performing and evaluating] is important to feel motivated. Motivation and possibility to participate creates engagement.

As previously noted though, this working culture needs the leadership's acknowledgement as well as space and time for such collaborative learning and development.

## 7 Conclusion

Professional learning in educational organisations can be a challenging issue. For an organisation to learn as an organisation, there has to be a common direction of its collective activity; *a sense of direction*. In the present work-in-progress study we investigated how teachers in preschools and schools perceived their digital competence and how they considered their opportunities to improve their competences. The study was based on two baseline questionnaire investigations including 21 preschool teachers and 16 primary school teachers. The first baseline questionnaire was distributed in February 2018 (by the start of the project) and formed a 'current-state' baseline. The second questionnaire was carried out in June 2019, where the outcomes formed a 'new-state' condition. The project as a whole includes several other kinds of data, but this work-in-progress paper only focuses on the quantitative data from these questionnaires and a simple statistical analysis. In addition, as some of the questions included space for open answers or comments, the analysis also included a qualitative coding of the written statements from the teachers.

In general, the teachers experienced that their digital competence increased between the first and second questionnaire; 74% of the teachers perceived themselves as being digitally competent after the second questionnaire. However, considering how they found

their opportunities to cultivate or improve their competences, they expressed a concern of lacking adequate tools acknowledged by the leadership, in particular related to space and time for sharing knowledge as well as learning from each other as colleagues. This resonates with Rikkerink et al. [21] who states that sensemaking processes are intersubjective and involve complex interactions between the domains of leadership, context, teacher characteristics and teacher learning in the practical use and sensemaking of digital technologies. Hence, we argue that it is important for the continuation of the present project to focus on the cultivation of the integration of digital technology, rather than blindly focusing on the teachers' confidence with and knowledge of digital technologies in teaching and learning situation [c.f. 23]. In other words, to become digital competent concerns a careful cultivation of a learning organisation, i.e. a holistic sense of direction.

The results from the questionnaires suggest that the DIA model, when adequately adjusted to the current digital landscape, can open up for a holistic view embedding organisational learning and promoting collaboration. Here, a relational practice [c.f. 28] constitutes recurring activities that embodies explicit values and norms, for example, making space and time for the cultivation of collaboration cross-over competences. This can generate a resourceful and socially integrative organisation. The implications of the findings of this study is that an organisation that wants to learn and develop as an organisation needs to bring about a culture change implied by the adoption of such constitutive practices. We identified three constitutive components that we argue can foster the cultivation of integrative activities and, accordingly, promote a learning organisation, namely: (1) shared comprehensive influence, (2) reconstitution of space and time for shared learning, and (3) tools to mediate professional learning. These components are closely aligned with the DIA model.

However, if these components should form a *sense of direction* and as such a context for strategic renewal considering the individual teacher and the team of teachers, the leadership practice should act as an engine for the organisational learning to create a dynamic balance between the teachers' experienced pressure [21]. Crossan et al. [29] explain this as flows of learning at every level of the organisation. The authors clarify this by placing processes of sensemaking at an individual level, which concern personal interpretations of experiences. This can lead to new ideas or new ways of approaching tasks. However, the effects of individual learning can only influence others when it is demonstrated and shared with colleagues who have had similar experiences. These exchanges of experiences are what Rikkerink et al. [21] characterise as *collective sense-making* at a group level. This is where shared ideas can lead to mutually coordinated practice-based professional learning. The outcomes of this study have shown that this is not a straight-forward process, but rather turbulent, where feelings and knowledge (new and old) are mixed with each other and create tensions and worries. Thus, what the teachers ask for simply creates meaning: they want to try out for themselves new teaching and learning practices and then discuss their experiences (or lack of experiences) with their colleagues. When combined with the DIA model, including a distributed leadership, such repeating sensemaking processes could create a stability rather than worries and tensions, and as such create a pedagogy for professional learning.

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