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Abstract

This study examines educators' experiences of implementing research-practice partnership (RPP) in three schools in Finland's capital area. The data consisted of educator interviews (*N* = 12) and self-report questionnaire responses (*N* =101). Teachers' experiences were traced by data-driven thematic analysis of the interviews and quantitative analysis of survey responses. The results indicate that RPP provided a successful strategy to contribute to school development aims as long as it was integrated coherently into schools' operations. Targeted time resources, teachers' developer roles, and joint work, such as involvement in boundary crossing activities, fostered successful implementation and achievement of the targeted development aims. However, within-school power dynamics appeared to be a hindering factor. The results indicated an unexpectedly strong segregation of teachers according to presence or absence of their developer role. The reached outcomes related to experienced school-specific organizational innovations and professional growth of those educators who engaged in boundary crossing activities.

Keywords: boundary crossing, continuous professional learning, organizational development, pedagogical innovations, research-practice partnership (RPP)

Introduction

Research-practice partnership has emerged as a strategy for promoting educational transformations by engaging educational practitioners and researchers in sustained collaborative efforts to solve practice problems that hinder school transformation processes (Farrell et al., 2022). The present investigation was inspired by Penuel and his colleagues' RPP framework (Penuel et al., 2015) which was, however, adapted to our national context and the purposes of larger research projects on which the present investigation was anchored. At the end of this paper, we discuss the extent to which our version of RPP corresponds to those reported by other investigators. Furthermore, this study focused on educators' views on the co-development process and its outcomes, aspects that have been identified as research gaps by earlier research (Coburn & Penuel, 2016; Farrell et al.,

2022; Linton, 2019).

Joint work across the boundaries

In order for RPP to be mutually beneficial, it is critical that educators and schools are not considered objects of research but rather as collaborators, shaping and benefitting from the intertwined research and development process as it proceeds (Coburn & Penuel, 2016). Because the roles and responsibilities of RPP are likely to be previously unfamiliar to both researchers and educators, differing expectations may initially lead to confusion and uncertainly (Coburn & Penuel, 2016; Wentworth et al., 2017). Thus, RPPs should involve mutual engagement across multiple boundaries throughout the entire process of design, implementation, and sustainability (Penuel et al., 2015). Boundary crossing, that is to say, collaboration with experts from other fields than practitioner's own in order to build and share knowledge and work towards a common objective, enables participants from different communities to learn to collaborate productively, possibly changing their practices and developing novel practices at the boundary zone of RPP (Akkerman & Bakker, 2011; Kali et al., 2023).

Penuel and his colleagues (2015) characterized RPP as joint work at multiple boundaries, arguing that engaging researchers and practitioners in *boundary crossing* can nurture learning potential through partner and contextual disparities. They hence argue that RPP entails collaboration and reciprocal exchange, which are complex but potentially more productive and transformative processes than mere translation of research knowledge into practitioners' language could be (Penuel et al., 2015). Well-organized joint work between research and practice communities, that is *boundary practices*, can help to address and manage power dynamics leading to more effective and equitable partnerships (Farrell et al., 2022; Henrick et al., 2017; Penuel et al., 2015; Sjölund & Lindvall, 2024). Farrell et al. (2022), for example, claim that existing RPP

frameworks are not sufficient to describe what the actual work of collaboration looks like and under what conditions partnerships are able to create equal power balances and mutual understanding.

RPP fostering teacher participation

In addition to the functional boundary practices, pre-existing organizational capacities and conditions can have an impact on longer-term outcomes of RPP (e.g. Farrell et al., 2022). Here the role of leadership is vital to guide the development work (Fullan & Quinn 2016; Lahtero et al., 2017; Senge, 2000). Leaderships' influence has been found to be essential, for instance, in the organizational learning climate (Vermeulen et al., 2022) and in constructing actor identities, positionings and agency in development collaborations (Vedder-Weiss et al., 2020). Hence, leadership, with the support of teachers, mediates school development efforts, and employee-driven innovation (Kesting & Parm Ulhøi, 2010), often gained through teachers' transformative agency (Reinius et al., 2022; Stetsenko, 2017), which is critical for the successful pursuit of educational innovations. Transformative professional agency, realized in teachers' innovative professional activity, entails participation in improving collective rather than merely personal practices, and, therefore, it is highly dependent on organizational support (Kesting & Parm Ulhøi, 2010; Reinius et al., 2022).

Because of the high level of autonomy in Finnish schools and among educators, top-down efforts to enforce educational change are unlikely to succeed (Hargreaves & Shirley, 2009, Lavonen et al., 2015). In other words, without practitioners' acceptance and voluntary contributions, significant educational developments are not likely to take place. Rather than starting merely from pre-given and top-down objectives, RPPs involve extensive tracing of the experienced developmental needs and improvement ideas of educators.

Cyclical and iterative RPP development processes

The effort to implement RPP-mediated iterative and cyclical school development processes was

also inspired by educational improvement science (Bryk et al., 2015). Tailored, need-orientated and school-specific development processes proceeded through four phases, which involved the joint work of researchers and educators: (a) collecting data describing the current situation and assessing development needs, (b) designing improvements and making changes, (c) evaluating and reflecting on changes, and (d) implementing and expanding the designed improvements. RPPs that focus on educational challenges vary in scope; The focus can be narrow targeting for example improvement of study results in some specific subject or broader targeting to transform the school culture more profoundly (Farrell et al., 2021).

Our research was oriented towards the broader needs of the school practitioners, based on joint work at boundaries and relying on experienced needs in the field. The research project set up was agreed at the municipality level, thereby the strategic digitalization aims of the education provider as well as school-specific needs were acknowledged (Korhonen et al., 2024). The study was also design-centric (Kali et al., 2023) in the sense that it examined how to co-design novel practices that will work effectively and benefit practitioners across a range of school settings.

In this study, we investigated educators' perspectives and perceptions on participating in co-development processes and their views on development outcomes in three schools in the Finnish capital area. Citywide and national reforms of digitalization of the educational system challenged the participating schools, for instance, to diversify evaluation practices, transform school spaces into flexible physical learning spaces, move from solo to team-teaching practices, and enforce inclusive teaching practices (Helsingin kaupungin opetusvirasto [School District Office of Helsinki], 2016). Here, digitalization of the educational system is understood as a comprehensive systemic change in transforming the professional and pedagogical culture prevailing at schools, rather than just changing non-digital practices into digital or hybrid forms (Hakkarainen et al., 2015; Jesson et al., 2018; Korhonen et al., 2023; Ritella & Hakkarainen, 2012). Consequently, introducing, integrating and then infusing technologies into pedagogical practices and educational

systems requires situated and multifaceted knowledge on the side of educators (Mishra & Koehler, 2006; Starkey, 2020).

Overall, educational changes take place relatively slowly. Multidisciplinary efforts and close collaboration between educators, researchers, education administrators, and policymakers are needed to overcome practice-related challenges in the field, and to connect the implementation of strategic goals, educational reforms, and pedagogical innovations (Fullan & Quinn, 2016; Penuel et al., 2015). The current study examines how educational renewal of schools, fostering the implementation of novel professional and digital-pedagogic practices, can be supported by research-practice partnerships (Coburn & Penuel, 2016). Korhonen et al. (2024) have found promising results concerning the establishment of RPP partnerships between university researchers, regional education providers, schools and educators in Finnish educational contexts. The present study contributes further to the literature by offering educators' insights into the RPP co-development process, the implementation of joint work and boundary crossing activities, as well as achieved innovations in the Finnish context.

Research aim

The study investigated educators' perceptions on practice-driven, systemic school development processes conducted in research-practice partnership (RPP) with education practitioners, researchers and other external experts in three participating schools in the Finnish capital area. We particularly focused on educators' views on the implementation of the development process as well as the outcomes achieved, as these have been identified as gaps in previous literature (e.g. Coburn & Penuel, 2016; Farrell et al., 2022, Linton, 2019). In this study, educational practitioners and researchers crossed multiple boundaries by jointly engaging in co-design of educational improvements addressing the real need of practitioners. In sum, we examined educators' experiences of participating in the collaborative school development processes in partnership with

university researchers, posing the following research questions:

(1) What were the key **implementation factors** of the collaborative school development process according to educators?
(2) Which **stakeholders** did educators perceive as being involved in the school development process?
(3) What were the experienced developmental **outcomes achieved** through collaborative school development processes according to educators?

Method

Context

The study was conducted in the context of a strategic research project, which not only aimed at the production of cutting-edge academic research on digitalizing education but, in accordance with "Mode2" research (Nowotny et al., 2003), also involved intensive researcher–practitioner dialogue for making societal impact and fostering personal, social, and institutional renewal. Toward that end, the project was from the very beginning aligned with a major digitalization program of municipal-level education authorities (education provider) in the capital area of Finland. The education provider collaborated with the university in this strategic research project. Further, the strategic project aimed at creating RPP to co-configure educational transformations taking place during the digitalization program and support educators in their professional learning and innovation (Korhonen et al., 2024).

To implement the project, an interdisciplinary research network consisting of groups of researchers, teacher-practitioners, and the municipal education provider was created. Schools were able to sign up voluntarily to the developmental research project, and an education provider selected the participating schools based on demographics (location, size) covering all areas, and initial developmental needs stated by the principals and teachers in schools' management teams. RPP

collaboration was organized so that a research project's management team agreed to the main lines of collaboration with the leaders of the municipal education provider (macro level); researcher teams collaborated with school leaders and management teams (meso level) to co-plan and steer the school-specific development processes; and researchers, trainers and other external experts collaborated with teachers (micro level) in order to co-create and facilitate the trainings, workshops and development activities to foster schools' development aims. A part of the strategic project funding and resources of the municipal education provider were allocated to schools to hire substitute teachers so that teacher participants could invest in a certain number of days for developmental activities (cf., Penuel et al., 2015). The authors of this study represent various levels (micro, meso, macro) of the collaboration. The first and third authors participated in the development activities with school leadership (meso) and with teachers (micro). The second author was responsible for the municipality-level collaboration (macro), and the last author collaborated both with municipality leaders (macro) and with school leaders (meso).

Research setting

In this section, we elaborate the applied co-development process, which consisted of three phases in accordance with design-implementation-sustainability: *initial mapping*, *interventions*, and *evaluation* (Figure 1). These three phases of the co-development approach represented the joint engagement of practitioners and researchers throughout the entire process. Only the co-development approach was pre-designed by researchers, while the themes, actual activities, and outcomes of each phase were school specific and shaped as a result of joint work between school practitioners, researchers and other external experts. This approach was used to mitigate the power imbalances between researchers and practitioners and to engage the whole teacher community in joint

development work[1]. Accordingly, each phase incorporated joint work activities: defining the school-specific development aims (initial mapping phase), designing and conducting the intervention (interventions phase), and planning upcoming, continuous school development activities (evaluation phase).

[Figure 1 near here]

Initial mapping

Co-development activities were launched in participating schools by introducing the co-development approach (RPP), becoming familiar with the partnering schools, and conducting initial mapping to lay a common ground to the development aim setting. During the mapping phase researchers administered a pre-designed teacher questionnaire and interviews inviting educators to openly elaborate on schools' operational culture, pedagogical practices, professional development aspirations and experienced school development needs. Hence all teachers were engaged and their views on co-development aims and school culture were examined. These data were analysed by the researchers and then utilized to collaboratively define school-specific development aims. Determining and specifying the development aims of each school took place in collaboration with researchers and practitioners in workshop-type meetings with both the school management team and with the entire school personnel. Hence, needs-based developmental aims which were worked on jointly during the interventions phase arose from the experienced needs of the school practitioners, according to RPP principles.

[1] The autonomous and professional nature of teachers in the Finnish educational system should be addressed. In addition to teachers' Master's degree, they have a high degree of autonomy in planning their teaching activities and are significantly involved in local curriculum design and implementation (Lavonen, 2020).

Interventions

The implementation of interventions and co-development activities were collaboratively designed with practitioners. The schools' development aims required tailored interventions involving consulting experts and utilizing trainers in these specific areas. During a two-year co-development period, a number of trainings, workshops, co-design meetings and knowledge-sharing events (e.g. webinars on specific pedagogical themes) were organized in each school. These events represented boundary practices involving participants with varying roles and different expert areas. For example, workshop contents and activities were collaboratively planned and jointly facilitated by educators, researchers and other external experts. These events further served as forums where ideas from research and practice interacted and elicited and utilized relevant perspectives and knowledge from all participants (see Farrell et al., 2022; Penuel et al., 2015). Further, researchers organized across-school peer-meetings for principals concerning common development needs. To assess progress and to guide the advancement of the intervention, researchers collected additional data and performed rapid analyses resulting in school-specific summaries, briefs and graphs. Researchers fed these reports back to educators for validation. These reports represented boundary objects (conceptual or material tools that mediate joint work) and served the evidence-based decision making of the participants (see Farrell et al., 2022; Penuel et al., 2015; Wentworth et al., 2017). The schools also conducted independent activities utilizing internal resources and reaching out to various external partners to achieve their development objectives. During the interventions phase, the activities were often broken down into smaller tasks, and it was agreed upon which tasks each (educator/ researcher) would be responsible for.

Evaluation

For sustainability of the innovations the co-development period of two school years was followed by researchers re-administering a teacher questionnaire and interviews inviting educators from each

participating school to share feedback on their co-development experiences and elaborate on their views on the achievements gained from the collaborative school development process. Rapid analysis of these data and sharing them with practitioners provided the practitioners with an understanding of the remaining developmental needs and new innovation ideas arising from their past experiences. These data together with introspective discourse among educators and researchers provided direction to schools in proceeding the continuous school development independently, accompanied by the knowledge and experience gained from the partnership with researchers and other external partners. The in-depth analysis of these data served as the research data for this study.

Participants and data

This study focuses on three schools that completed a two-year intervention phase of the co-development process: School A (under 150 students) and School B (under 500 students) were primary schools and School C a comprehensive school (over 1000 students). In the initial mapping phase described in the previous section, needs-based developmental aims were defined. Each school had their own development objects (Table 1) based on the experienced needs of educators. Since the schools were of diverse sizes and had different student demographics and school premises, their development objects appeared to vary considerably. However, all the development objects identified incorporated digital technology into the new practices developed during the interventions. As far as school-specific development objects were concerned, incorporating digital technology varied between the participating schools. In School A it meant taking new digital tools and practices into use in teacher collaboration, teaching, and evaluation, while in School B teachers needed to just intensify their collaboration with the support of digital tools. In School C, digital technology was related to development objects in two ways: It was tightly integrated into various practices at schools and fostered the development work, but at the same time digital pedagogy was also a recognized development object in that school.

[Table 1 near here]

The data consisted of semi-structured educator interviews (N = 12) collected in the academic year 2021–2022 upon the completion of the co-development period. Along with the principal, three teachers from each school were selected to be interviewed based on their roles in development activities (two teachers with and one teacher without a developer role) (Table 2). The same interview frame was applied in each interview, which covered the following themes: aims, outcomes, and evaluation of the school development process.

[Table 2 near here]

Further, a teacher questionnaire was administered in each participating school as part of a teacher meeting that took place on concluding the co-development activities. Altogether, about a hundred responses (N = 101) were received, the response rate being 80% (Table 3).

[Table 3 near here]

The questionnaire consisted of 30 items examining teachers' experiences concerning their participation and perceptions of the implementation and outcomes of school development processes. Three open questions traced school-wide and personal implications for the school development process, as well as the pros and cons of the development process. A total of 59 teachers out of 101 responded to the open questions; these responses were included in the qualitative data analysis.

Teachers were also asked to indicate whether they operated in any kind of developer role. A total of 26 teachers reported that they operated in developer roles, such as a management team member, tutor or mentor teacher, or they functioned in another, informal developer role that related to a particular school-wide or municipality-level development project, such as the current RPP project. These teachers with informal, project-related development roles acquired their development responsibilities by volunteering or by being asked to join development activities by principal or management team. They were enthusiastic and skilled in the areas of school development aims.

However, as they did not have a formal developer position in school community they were differentiated from their peer teachers, both regular teachers and teachers with formally nominated developer roles. Teachers with developer roles overall, did not receive any specific preparation for their role other than joint work events, workshops and trainings that were an inherent part of the RPP development process (Figure 1). From now on, all teachers operating in any kind of developer roles are referred to as teachers with a developer role and their peers as teachers without a developer role.

Data analysis

Complex, multisystemic and multidimensional phenomena and contexts cannot always be easily adapted to a traditional well-controlled research setting (Snow, 2015), hence we applied a multimethod approach in this study. The qualitative data provided the results to research questions 1and 3, whereas the quantitative data responded to research question 2.

Qualitative data analysis

The twelve 45-minute-long interviews were transcribed, coded, structured, and analysed in Nvivo. Upon reading one third of the transcripts, thematic coding was conducted to summarize the topics of the data into descriptive codes (Saldaña, 2016). The identified themes were further explored after coding all the transcripts and re-reading coded text references. Furthermore, 59 responses to three open-ended questions in the teacher questionnaire were also coded in Nvivo by using the interviews' analytic framework, confirming the findings from the interviews, and supporting the formation of the sub-categories. The total number of references included in the analysis was 826. The final coding structure contained two themes: implementation, including fostering and hindering factors; and outcomes, encompassing also outcomes that extended beyond the pre-defined objectives across all schools. The categorization framework with main and sub-categories was formed after literature-informed analysis (Table 4).

[Table 4 near here]

Quantitative data analysis

There were 30 items in the self-report questionnaire inquiring into teachers' experiences concerning their role and participation in co-development work; the co-development process, organization and collaborators; as well as solution testing, implementation, and evaluation. The data represented the perspectives of the entire personnel and, thereby, complemented the teacher interviews. All items followed the same structure: "*To what extent did the teachers participating in the co-development process adhere to the following assumptions. During the co-development process we have…* ." Teachers were asked to evaluate items on a 5-point scale from 1 = *it is not at all characteristic* to 5 = *it is very characteristic*. Items were outlined by the group of researchers and were based on school development literature and mirrored RPP principles.

Exploratory factor analysis (EFA) was performed to explore the underlying structure of the co-development process and to find correlating aspects of the questionnaire items. Altogether four factors were found. Factors were loaded by representing various stakeholders with whom the collaborative school development activities were performed: F1 – Collaboration with school leadership and colleagues, F2 – Collaboration with external stakeholders and guiding factors, F3 – Collaboration with pupils and parents, and F4 – Collaboration with researchers. On the basis of the factor solution, four composite variables were formed (Table 5), which acted as a base for the second research question. The four average variables had a high internal consistence (see Table 5 for Cronbach's α).

[Table 5 near here]

Further statistical analyses were performed to explore whether background variables (school, educators' developer/ non-developer role) associated with how the educators perceived the collaboration with various stakeholders during the co-development process. An independent

samples t-test was performed to explore whether the developer/non-developer role demonstrated any differences between these teacher groups, and several one-way analysis of variance were performed to examine whether there were school-related differences between educators' experiences. We performed multiple comparisons post hoc tests with Bonferroni corrections after Levene's test revealed that the variances were equally distributed. Finally, the statistical significance was set at $p < .05$.

Results

Key implementation factors of the collaborative school development process

To answer the first research question, we examined educators' descriptions of the collaborative school development process and identified three key implementation factors: practice integration, joint work, and contextual circumstances. Each factor incorporates aspects that the educators found either fostered or hindered the success of the collaborative school development process (Table 6).

[Table 6 near here]

The first factor, practice integration, indicated that the essence of successful implementation was the integrating development process with schools' regular structures and procedures in terms of collaboration practices and times. Firstly, practical utilization of resources was found to foster the implementation. Educators indicated that they found it useful that development work was carried out within existing school structures alongside teachers' regular responsibilities. For example, annual planning days and weekly staff meetings were used for co-design sessions targeted for all the staff, such as initial mapping sessions, trainings, and workshops. Although joint events enabled all teachers to engage in school development activities, the interviewees pointed out that it is not feasible to have too many all-staff events in a busy school year: "There have been just as many joint sessions and opportunities to influence as I think it is possible to organize during this kind of school

life."[2] (B2). Also, educators considered it practical to prepare, innovate, and design solutions to development objects in small teacher teams composed according to the teachers' interests and roles at school. The team activities were integrated into school structures and educators' weekly agendas through management team meetings, teachers' peer-to-peer planning times, and aligning the development tasks with their areas of responsibilities, e.g. the subject matter or specific pedagogical theme-related objectives. Teachers reported enjoying peer-to-peer co-planning sessions as long as their working hours were properly managed: "It's so satisfying when you can plan together with someone." (A3). Further, according to both teachers and principals, another successful way to reinforce school development and innovation emergence was to release teacher teams from teaching obligation for a full day by using substitute teachers to take over their teaching duties. Invariably, interviewees considered that this approach assisted in developing well-planned improvements rather than merely testing out unfinished ideas. In addition, teachers had overall a better buy-in to test innovations designed by their colleagues: "When people from your own school present some of their plans, which they have thought through, they are more easily accepted." (A2).

Secondly, within-school segregation between educators' roles was found to hinder implementation. The data revealed a substantial divide between educator roles regarding participation and commitment to development activities as well as an awareness of the progression of developments. All participants, despite their roles, reported that teachers with developer roles were more aware of the content and progress of the development work in their school than colleagues without a developer role. Awareness of the issue of internal segregation is well illustrated by one of the teachers with a developer role: "It may be that some of my colleagues have a different impression [of how the development work is proceeding], because now I'm kind of in the middle of it [the development process], and I am aware of it how it proceeds." (B3).

[2] All quoted excerpts have been translated by the authors from the original Finnish.

Thirdly, insufficient communication was found to hinder the implementation. The analysis revealed, further, that adequate and timely school-wide communication concerning overall co-development project as well as progress updates of specific development aims was considered important, but insufficient according to the educators, and in particular according to teachers without a developer role. The data revealed that information was not considered to flow to the entire school community from the leadership, management teams, and small teacher teams designing the pedagogical innovations. As a consequence, irregular, scarce and unequal communications was thus stated to hinder the rest of the participants' commitment to development work.

The second factor, joint work, indicates that a tailored, school-specific development approach carried out in collaboration with practitioners and researchers was another key implementation factor. Firstly, practice driven, needs-based development aims derived from practitioners' initiatives were considered to foster the implementation according to educators. Customized solutions were felt to be motivating by the educators, as their schools' unique conditions were considered and development aims were aligned with school- and city-level strategies. Participants stated, for example, that training contents and workshops were interesting, rewarding, and directly related to their own work and school. Overall, participants' reflections revealed that a fully school-specifically tailored project was an unexpected and novel, yet very positive experience to educators.

Secondly, multi-professional collaboration was also considered to foster the implementation. Educators, especially those with a developer role, felt that multi-professional collaboration was rewarding due to the perspectives that they received from professionals working outside school. In addition to actual theme-specific expertise provided by numerous external content experts, researchers also received credits for orchestrating the development processes. School leadership, management team members and small teacher teams designing the pedagogical innovations appreciated researchers sharing the responsibility of guiding the process progression by, for

example, facilitating meetings, keeping memos, and identifying and linking content experts. These project management types of tasks conducted by the researchers were often considered pivotal by the participants in terms of boosting the developmental activities in the midst of the busy school days, as illustrated by this teacher from school B:

> We've been able to innovate and plan. And that's what has felt really nice on the school's side, since we've had that freedom. We didn't have to note things down in these, for example, in our joint meetings, but we were free to use that time for discussions, and then the researchers took care of recording the notes and then reminding us of what the next steps are. (B2)

The third factor, contextual circumstances, indicated that school cultural aspects as well as external preconditions and unexpected disruptions were also key factors impacting on the implementation. Firstly, the personnel's orientation towards change and collegial school culture was considered to foster the implementation of the collaborative school development process. The data revealed that participating schools had overall a favourable approach to school development, as participants from all three schools reported as existing features visionary leadership, previous participation in developmental initiatives, and already advanced practices in certain pedagogical aspects (e.g. co-teaching in school B). Hence, in that sense the collaborative development project was overall smoothly received by the participants, and collaboration with colleagues and external experts and researchers was reported to be fluent. However, some of the participants pointed out that failures in leadership such as engaging all staff, neglecting opportunities of employee-driven innovation, and overlooking teachers' differing development-related roles and expectations are a threat to a successful school development process. Regarding School C, for example, the data implied that the leaderships' commitment to promoting co-development processes across all teachers was less obvious than in School A and B. As a result in School C, teachers and researchers were less engaged with hands-on tasks and leadership preferred delegating ownership of the development themes to allotted individual teachers or small teams, which led to sporadic development outcomes.

Secondly, schools' digital-pedagogical foundation that incorporated educators' digital-pedagogical competences as well as schools' shared digital-pedagogical practices and existing infrastructure, such as online access, devices and platforms, was considered to hinder the implementation. Digital-pedagogical foundation appeared to be quite a central aspect in the school development process, as in all schools the identified development aims were either directly or indirectly related to digitalization of educational systems. Some educators reported being competent and confident with the digital aspects of teaching and school-wide co-operation, whereas the majority of the participants stated precisely the opposite. The need for the advancement of digital skills and practices was clearly acknowledged in all schools. The concerns were especially highlighted in School A, where all the development aims were directly digital-pedagogical related, as exemplified by A4: "So, it's about both equipment issues and network capacity problems, these types of troubles, but also about the introduction of new routines and the adoption of their [educators'] operating patterns." Digital-pedagogical competences, practices and infrastructure were not, however, managed solely by schools, which made the development efforts more convoluted. The contribution of multiple partners was required as training, support, and soft- and hardware purchases were centralized through a municipal education provider.

Thirdly, educators reported external disruptions hindering their development efforts during a two-year development cycle, as schools faced several external challenges unrelated to development aims, which either overrun the co-development activities or demanded major adjustments in the co-development plan. For example, in School A, numerous school premise-related rearrangements (such as temporary facilities due to renovation) caused continuous limitations to school operations and teaching conditions as well as personnel absences, thereby straining the personnel. School B also faced issues related to construction work postponing the renovation schedule, causing frustration and uncertainty regarding preparation requirements and responsibilities. In addition, School B was to establish inclusive classrooms at short notice and thereby rearrange their

pedagogical preconditions which required additional resources. The main external challenge, however, was the Covid-19 pandemic, which caused complications when the Finnish government announced a set of restrictions closing schools and switching teaching to remote mode from mid March to mid June 2020. After March 2020, researchers were forbidden to visit schools, hence they collaborated virtually with educators until the end of the collaborative school development period. Covid-19 restrictions were experienced as a hindrance when experimenting with pedagogical innovations, prohibiting, for instance, mixing student groups, conducting benchmark visits, and meeting fellow teachers. However, the utilization of digital tools accelerated both in a pedagogical and in an organizational sense. The launch and utilization of digital platforms, internal memo entries, knowledge-sharing practices, digital liaison between school premises, and overall rationalized use of time with distance meetings were reported to be enhanced.

To sum up, the analysis revealed factors both fostering and hindering the implementation of the co-development process conducted in a research-practice partnership. In general, aspects related to within-school power dynamics, i.e. the presence or absence of the teachers' developer role appeared to be hindering factors; and aspects related to joint work and involvement in boundary crossing practices appeared to be fostering factors.

Stakeholder collaboration during the school development process

To answer the second research question, we identified four categories of stakeholders with whom the school development process was executed: collaboration with school leadership and colleagues, collaboration with external experts and guiding factors, collaboration with pupils and parents, and collaboration with researchers. (See Table 5 in the Data analysis section). The first category, collaboration with school leadership and colleagues, contained implementation-related activities conducted with the school's internal stakeholders, such as setting up and discussing development aims, producing and evaluating new solutions, being heard, and being able to influence the school's

development. The second category, collaboration with external experts and guiding factors, covered activities that deepened the contextual understanding of developmental themes through external expertise and artifacts (e.g. visualized reports of teacher questionnaire results, presentations of field studies, summaries of sought literature). This included being familiar with and taking into consideration previous research, initial mapping findings, and the views of external experts. The third category, collaboration with pupils and parents, consisted of activities related to involving parents and pupils in the school development process by asking pupils to produce, test, and evaluate new solutions. The fourth category, collaboration with researchers, contained implementation-related activities conducted together with the researchers.

Statistical analysis affirmed differences between teacher roles. The results indicated that teachers possessing a developer role perceived that the school's internal collaboration with leadership and colleagues ($t(65) = -2{,}910$, $p < .05$) as well as collaboration with researchers ($t(37{,}402) = -2.756$, $p < .05$) played a significantly stronger role in the co-development process than their colleagues who were without a developer role (Figure 2). Accordingly, teachers with a developer role perceived collaboration with various stakeholders and with school leaders, colleagues and researchers more intensively than teachers without a developer role.

[Figure 2 near here]

Further, statistical analysis of the teacher questionnaire also indicated differences between schools. Specifically, School C differed significantly from the other two schools in terms of how well collaboration with school leadership, colleagues, and researchers, as well as with external stakeholders and guiding factors characterized the school development process according to teachers (Figure 3). In School C, teachers perceived the school's internal collaboration with leadership and colleagues ($F(2) = 8.58$, $p < .05$, λ^2 partial = 0.36) and with researchers ($F(2) = 12.57$, $p < .05$, λ^2 partial = 0.39), as well as with external experts and guiding factors ($F(2) = 8.80$, $p < .05$, λ^2 partial = 0.26) to be significantly less characteristic of the co-development process than teachers

in the other two schools.

[Figure 3 near here]

Interview data supports these findings, as educators, especially those with a developer role, from School A and School B described several co-development activities and events carried out with the entire staff, in smaller development teams, or together with researchers and other external stakeholders. Educators from School C, on the other hand, were unable to describe as many co-development activities or events that had taken place during the co-development period.

Outcomes of the collaborative school development process

To answer the third research question, we examined educators' descriptions of experienced outcomes achieved across the three schools during the co-development process. The described outcomes were categorized into two main categories: organizational development, describing the outcomes in organization level; and professional growth, describing the outcomes on a personal level.

We considered the first category, organizational development, consisting of school-wide structural and pedagogical innovations that the schools had achieved or were working on. Structural and pedagogical innovations reported by educators were in line with the school-specific development aims that each school had identified during the initial mapping phase (see Table 1). It is noteworthy that participants portrayed development aims relating to school structures as completed after the two-year co-development period in Schools A and B, although this was not the case in school C. Whereas when describing pedagogical innovations, participants portrayed advancements that had taken place through improvement cycles in each school, they did not consider them to be completed yet. Data further revealed that pedagogical innovations were at least initiated in all three schools, and often progressed to the planning, trialling and even implementation stages. Therefore, we considered both completion and advancement of the innovations to be factual

outcomes of the collaborative school process. Because these organizational outcomes reported by educators were school-specific and based on each school's precise needs and unique contexts, we present the tangible outcomes considered as structural and pedagogical innovations here school by school.

In School A, the structural innovation described by educators was enhanced school-wide communication and collaboration structures and practices. Although School A was a small school, they still struggled with inefficient knowledge sharing and data storing structures, which were further worsened due to recent construction work on the school building. This forced some of the students and teachers to operate in separate premises, impeding the natural flow of acute news. Interviews revealed that educators from School A considered that the deployment of new digital communication and a data sharing platform, and adopting new platform functionalities had been pivotal with regard to information flow, material sharing, and meeting practices in their schools. Regarding pedagogical innovations, data revealed that as outcome to digital-pedagogical aims, School A had designed and conducted digital training (incl. introduction to key platforms, follow up messaging and e-portfolios) for immigrant parents so that they would more effectively support the schooling of their children. Parental trainings were organized in their native languages in collaboration with two external associations. They had also designed and implemented training to students to operate as digital agents to help their peers at school. Further, the educators had developed a mobile game to support students' civic-digital skills in collaboration with a number of stakeholders: pupils were engaged in the content creation and piloting processes, and various external experts, such as polytechnic students, collaborated in technical implementation and visual design aspects of the game. In addition, participants from School A stated that they had started developing novel evaluation practices to enhance students' self-evaluation skills. Implementation of new self-evaluation practices was not completed, although the data revealed that the first set of

materials was designed, school-wide implementation steps were agreed on, and the first pilots with a sample of students had taken place.

In School B, structural innovations described by the educators were related to school-wide co-teaching practices. School B possessed a long history of adopting co-teaching practices and had a strong identity in a collaborative working culture. However, during the initial mapping phase it turned out that there was no shared definition of co-teaching, and teachers actually lacked a common understanding of what was expected from them in relation to co-teaching practices. The data showed that as outcomes educators from school B had identified organizational developments such as establishing consistent co-planning guidelines and practices, re-organizing meeting structures providing additional co-planning time for them, and making curricular changes to allow teachers to better execute collaborative teaching. For example, teacher teams were required biannually to compose grade level specific plans on how co-teaching will be realized content and execution wise. The principal from School B stated that these improvements proved even more advantageous than expected as the Covid-19 pandemic caused absences and other major difficulties in school operations during the co-development period, and teachers were required to teach students remotely and operate in isolation from each other. With regard to pedagogical innovation, School B had two aims, one was enhancing the co-teaching practice as stated above, and the other was to prepare for inevitable pedagogical changes that an upcoming major overhaul of the school building would necessitate. The plan of the municipality was to modernize the school building into flexible school spaces and reduce the number of conventional classrooms and thereby prompt multiform teaching and versatile use of the learning facilities. Teachers from School B reported that workshops engaging all staff had been co-organized with researchers and external experts, and that during the workshops they had participated in planning and in simulating in order to further deepen co-teaching and inclusive practices when operating in new flexible school spaces. This work was not actualized into concrete work practices, since it was put on hold towards the end of the co-

development period because the renovation schedule was continuously postponed by the municipality.

In School C, there was no evidence that school-wide structural innovations had taken place. Pedagogical innovations, or rather development activities pursuing pedagogical innovations, appeared to be scattered, impacting individual teachers rather than the entire school community. During the initial mapping, School C teachers requested the clarification and unification of different aspects of the operating culture of their school as they were concerned about the absence of operational and pedagogical leadership and about the differences in working practices in four different school buildings. The data analysis revealed sporadic references on pedagogical innovations, which indicated that developing pedagogical solutions were dispersed among different teacher teams or even individual teachers taking part in various activities. These activities were related to school-specific development themes, such as evaluation (teachers piloted learning analytics software), digital-pedagogy (teacher conducted in-service digitalization training), inclusion and co-teaching (teachers participated in inclusion workshop series and students' network study). Some of the participants considered that there were no organizational outcomes achieved in School C, whereas some of the participants considered that in large schools separated approaches work better: for example, enhancing evaluation and co-teaching practices require different approaches for primary and secondary teachers.

The second category, professional growth, was considered to be a personal development outcome. Where organizational developments differed according to school, professional growth appeared to differ based on the role of the teachers. The professional growth reported by the educators was hence not related to the development aims or organizational activities of the schools, but rather in what role and to what extent the teacher was involved in the development activities. According to the data, there were teachers both with and without a developer role who reported gaining new ideas and skills, as well as applying new pedagogical and professional practices in their

work, either with students in their classrooms or with colleagues. We consider this to be improved pedagogical competence and it was illustrated for example by teacher A2: “I have noticed that this collaborative development work has had an impact on how I set goals for learning and how I describe activities, according to the goals, for students.”

The other two subcategories were identified as epistemic fluency and systemic understanding, and these more strongly characterized teachers with a developer role. Educators with a developer role indicated improved epistemic fluency by noting that they were inspired by the knowledge gained through their intense participation in development activities, trainings, and collaborative planning sessions with their colleagues, researchers, or external experts. Some educators also emphasized that certain aspects of research updates were refreshing and reminded them of the value of research-based development. Furthermore, teachers with a developer role reported that they had gained a wider systemic understanding that supported them in expanding their focus from classroom practices to school-wide or even more pervasive educational dilemmas, as well as encouraging a readiness to seek solutions to these dilemmas:

> Somehow you think about many things, how this can be carried forward and how that can be improved. You somehow look at those things from a slightly different perspective. In the past my thinking was more ‘What have you done in the classroom?’, but now it’s more ‘Well, how are these things done in your school?’ It’s as if you went totally to another level. (B3)

In the end, not all the targeted aims nor all the participants were considered to have been reached during the collaborative development process. There were educators who reported that despite the workshops and other development activities, no applicable solutions were yet available, as illustrated by B2: “Whether those [development aims] are concrete yet on an everyday level is another matter, and that can take time.” Whereas some of the educators reported that they had not noticed any factual school-level or personal implications concerning collaborative school development efforts: “Certain things have only remained at the level of words.” (C2). Finally, there were several teachers without a developer role who stated in the open-ended questionnaire

responses that they did not know which development activities or organizational developments stemmed from this particular co-development project as the activities conducted were usually intertwined in the schools' routines, and thereby contributed seamlessly to the school-specific needs.

Discussion

The purpose of this study was to investigate educators' perceptions on the RPP approach as a means to understand collaborative school development processes in three targeted schools in the Finnish capital area. The current study constituted organizational interventions engaging cross-sectoral collaboration with educators, researchers and other external experts, and was aimed to co-design school-specific, needs-orientated solutions for sustained use in schools. We focused on issues reported as gaps in the literature (e.g. Coburn & Penuel, 2016; Farrell et al., 2022, Linton, 2019), hence practitioners' perspective regarding RPP's implementation aspects, stakeholder collaboration within and across organizations, and outcomes achieved, including those outcomes that were not targeted or unfavourable/negative.

In the current study, the nature of joint work during the co-development process was embraced by the participants engaged in development activities, and they considered a fully tailored approach and multi-professional collaboration to be motivating and well-functioning. In line with RPPs effectiveness dimensions of Henrick et al. (2017), establishing joint work routines in the current study implementations could be seen to promote collaborative decision making and thereby guard against power balances between practitioners and researchers (see Henrick et al., 2017). Also, according to the boundary framework of RPP (Farrell et al., 2022; Penuel et al., 2015), educators described attending various workshops, co-design activities and meetings which represent boundary practices and boundary objects that were built in as inherent elements throughout the interventions. Furthermore, the analysis conducted by researchers supported educators' evidence-based decision

making (Wentworth et al., 2017) as the report was shared and discussed with practitioners to validate the outcomes and to decide on the next steps to take. The school's digital-pedagogical foundation was acknowledged to have an essential role in systemic school co-development processes as digital pedagogical and organizational solutions were either the primary focus or the underlying enabler of co-development activities in the current study. Digital-pedagogical foundation incorporates here teacher competences (e.g. Mishra & Koehler, 2006; Starkey 2020), common school practices, and technical infrastructures (Korhonen et al., 2022; Jesson et al., 2018).

When comparing teachers with developer roles with colleagues without a developer role, the results showed that the former perceived collaboration with school leadership, fellow teachers and with researchers to be more characteristic of development work than the latter. This result illustrates that during the co-development process, teachers with developer roles were required to cross sociocultural and epistemic boundaries across multiple contexts, disciplines and institutions (Akkerman & Bakker, 2011; Akkerman & Bruining 2016; Coburn & Penuel, 2016; Kali et al., 2023), such as school practitioners, school leadership, academics, regional governance, and other stakeholders, like civic associations, polytechnics, and various experts participating in the co-development processes.

The overall finding on relatively strong within-school segregation of personnel according to presence or absence of the developer role is novel, and may partially stem from emerging practices of providing teachers with such roles. Earlier studies regarding the power dynamics of RPP have focused on researcher-teacher authority and power imbalances undermining the mutuality of RPP (e.g. Henrick et al., 207; Penuel et al., 2015; Penuel & Gallagher, 2017; Sjölund & Lindvall, 2024; Vedder-Weis, 2020). However, the present results indicate that having or not having a developer role significantly shape teachers' participatory roles. The developer role is likely to be reflected in a teacher's sense of being able to contribute to school culture development (Reinius et al., 2024). Further, in the background of obtaining such a role are participants' developmental orientation,

motivation, and proactive effort (Reinius et al., 2024). Segregation of the developmental role was consequential. Where organizational developments differed according to school, professional growth appeared to differ based on the teachers' roles. Teachers regardless of their role reported to have gained and applied new ideas, skills and practices, which we considered to be increased pedagogical competence. However, mainly teachers with a developer role reported advancement of their epistemic fluency and systemic understanding. Such fluency entails capability in integrating diverse specialized and context-dependent knowledge, and for instance contributes to shaping the work environment by transforming problems into solutions (Markauskaite & Goodyear, 2017). Current studies in this field do not clearly show how RPPs impact on teacher professional learning (e.g. Linton, 2019), but it has been found that different kind of boundaries position actors in RPPs in different ways, which can then limit or facilitate the learning potential of RPPs. In the current study it became evident that those teachers who had engaged in collective developmental activities with their colleagues, researchers and other external stakeholders that are described as joint work on the boundaries (Farrell et al., 2022; Penuel et al. 2015) reported higher levels of professional growth compared to their peers.

Going forward, it is worth considering how to implement RPPs to engage and commit entire staff to systemic school development and thereby foster the professional growth of the entire work community. Kesting & Parm Ulhøi (2010) argue, that ordinary employees should be engaged in innovation decisions but notes that it is difficult to realize hidden potential in a supportive way. Reinius et al. (2024) on the other hand argue that different teacher profiles and diverse views on their opportunities to contribute should be considered, and then gradually engage all, both innovation-oriented and those who are reluctant, in school culture development. Since not everyone necessarily considers themselves as an inherent part of the school level systemic development process or perceives organizational level operations occurring around them (Reinius et al., 2024). Nonetheless, RPPs are considered to cultivate teacher leadership (Vedder-Weiss et al. 2020) and it

is a question of school leadership to guide the development work (Fullan & Quinn, 2016; Lahtero et al., 2017; Senge, 2000). Pedagogical leadership plays a central role in expanding innovative practices of teaching and learning at school (Korhonen & Lavonen, 2017). Formally acknowledging and legitimating teachers' innovative professional activity and transformative efforts, and empowering and providing resources have proven to be useful (Korhonen & Lavonen, 2017; Messmann & Mulder, 2011; Reinius et al., 2022) in disseminating their explorative efforts.

To conclude, this study built on local knowledge of practice and aimed to lead to a sustained impact beyond the time span of the RPP process. The study contributes to the international scientific debate regarding the supporting and hindering factors of educational renewal (Coburn & Penuel, 2016), systemic challenges of digitalization in the educational sector (Jesson et al., 2018; Markauskaite & Goodyear, 2017), and other major reforms in educational contexts (Korhonen & Lavonen, 2017; Soini et al., 2016). The context of the study was Finnish, city-wide education digitalization strategy (Helsingin kaupungin opetusvirasto, 2016). The current study showed multiple factors indicating that RPP implementation should be coherent and seamless with the schools' everyday operations to ensure the educator's commitment to the development process. To overcome limited collaborative planning time at school, we recommend that leadership allocates time resources to developer-teacher teams in accordance with distributed leadership practices (Lahtero et al., 2017). Co-development processes are lengthy, spanning several school years (Farrell et al., 2022). Hence, it is the responsibility of leadership to ensure that the gained knowledge and development progression updates are continuously shared among all staff in order to include all teachers in systemic changes (Fullan & Quinn, 2016; Senge, 2000; Soini et al., 2016). Finally, we consider transitioning from RPP to independent continuous school development as the ultimate goal of co-development. This goal of cultural transformation should be regarded throughout the co-development process, and therefore school development efforts should be seen as the regular, routine responsibility of each teacher, and not considered to be an additional task for the few.

Reflections on RPP approach

Due to the novel and manifold nature of the RPP approach, it may be appropriate to reflect on the nature of the present investigation as a research-practice partnership (RPP) study a little more. Penuel et al. (2015) characterized their approach as descriptive rather than prescriptive in nature and maintained that there is no clear normatively correct approach on RPP prevailing in the field. Various RPP approaches assist people and organizations to integrate their efforts across boundaries and effectively improve the quality of teaching and learning (see also Penuel & Gallagher, 2017). As follows, we interrelate some principal features of RPP with practices developed in our own project.

Firstly, RPP focuses on practice-problems which in our case were represented by practitioner-identified developmental needs. Secondly, the long-term commitment required by RPP involved intensive field work at the present three schools across two years and structured collaboration between researchers and a municipality-level education provider across six years. Thirdly, a mutualistic relationship involved engaging both researchers and educators from schools in working towards shared developmental targets shaped by municipality-level strategic objectives. As detailed before, our RPP engaged researchers and educators in crossing boundaries and joint work at boundaries (Penuel et al., 2015). Edwards (2012) considered such boundary work to be a crucial aspect of productive multi-professional collaboration. Further, the depth of our commitment to RPP was evident in the deliberate sharing of some of the strategic project funding with teacher practitioners to enable repeated fulltime investment in developmental work (Penuel et al., 2015, p. 193). Allocation of funding to practitioners, for its part, was enabled by the impact-focused strategic research project. The project not only entailed changes in school but also research practices even in terms of some initially reluctant researchers learning to conduct rapid data analyses. These analyses fed research results into the field for further consideration, critical discussion and elaboration.

Finally, the project created multi-level boundary practices for orchestrating RPP at micro- (classroom level), meso- (school level) and macro- levels.

Limitations

The present investigation focused on tracing teachers' retrospective experiences of participating in RPP. To address the claims of the quality, utility, and relevance of design-based educational research (Wentworth, 2017), the study relied on mixed methods and involved collecting both active participant interview data, a larger body of teacher questionnaire data and validated interpretations in workshops with practitioners. These multiple sources of anonymised data assist in validating the findings and mitigating possible positive bias due to personal-professional relationships between researchers and educators involved in this study.

A further limitation of this study is the relatively small sample size. The intervention was carried out in three schools, which were different in size. Moreover, results revealed that participants' experiences were divided according to their developer or non-developer roles, which indicates that power dynamics within an organization were likely to occur and might have affected participants' behaviour and experiences although the development objectives were defined based on all the educators perceptions during the initial mapping phase. Although power dynamics between participating stakeholders (education practitioners, researchers and other external experts) were not apparent in the data, this does not necessarily mean that they would not have occurred. Furthermore, the length of the intervention phase was limited to two academic years, which can be considered a relatively short time for initiating and consolidating organizational transformations. On the other hand, two years is a sufficiently long period for doing intensive and consequential co-development in the field.

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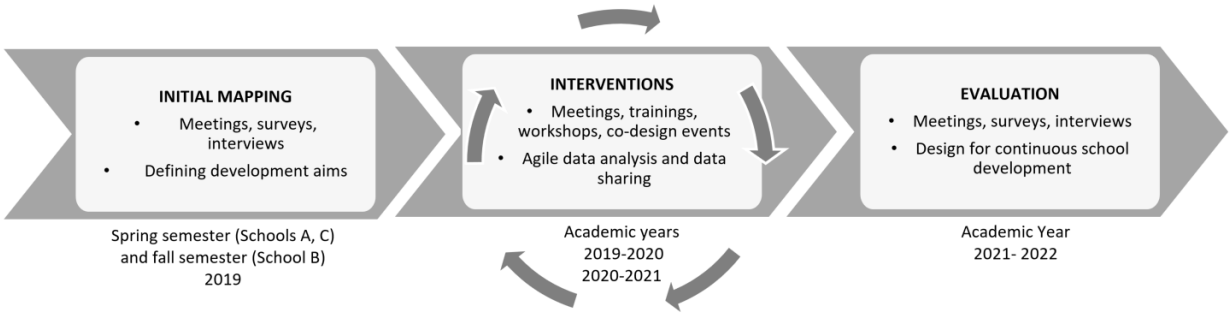


Figure 1*: Process map and timeline of the co-development approach applied in this study.*

***Table 1**: Development objects identified in the participating schools.*

School	Development object
School A	1. Enhancing ***communication structures***
	2. Evolving ***digital pedagogy*** practices
	3. Developing digital ***evaluation practices***
School B	1. Further evolving ***co-teaching practices & inclusive pedagogy***
	2. Preparing pedagogical practices for new ***flexible learning spaces***
School C	1. Establishing a unified ***operating culture*** supported by commonly agreed
	a. ***Leadership*** structures
	b. ***Evaluation*** practices
	c. ***Inclusion and co-teaching*** practices
	d. ***Digital pedagogy***

Table 2: *Educators interviewed (N = 12), 3 principals and 9 teachers.*

School	Teacher	Developer role (yes/no)	Role at school	Gender
A	A1	Yes	Principal	F
	A2	Yes	Classroom teacher	F
	A3	Yes	Classroom teacher	F
	A4	No	Classroom teacher	M
B	B1	Yes	Principal	F
	B2	Yes	Classroom teacher, management team member	M
	B3	Yes	Classroom teacher, management team member	F
	B4	No	Classroom teacher	F
C	C1	Yes	Principal	F
	C2	Yes	Subject matter teacher, management team member	F
	C3	Yes	Classroom teacher, management team member	F
	C4	No	Student counsellor	F

Table 3: *Teacher questionnaire respondents (N = 101)*

School	Number of respondents	Male/female	With developer role/ without developer role	*Number of teachers in the school*	*Response rate (%)*
A	9	1/8	5/4	*10*	*90%*
B	22	7/15	6/16	*27*	*81%*
C	70	12/58	15/39*	*100*	*70%*
Total	**101**	**20/79**	**26/59***	***137***	***80%***

* *Note:* eight teachers did not respond to the developer role question.

Table 4: *Analytic framework based on research literature-informed and empirically-driven data analysis.*

Research question	**Main categories**	**Sub-categories**
Key implementation factors (RQ 1)	1. Practice integration	Resources (+) Segregation of roles (-) Communication (-)
	2. Joint work	Practice-driven approach (+) Multi-professional collaboration (+)
	3. Contextual circumstances	Development orientation (+) Digital pedagogical foundation (-) External disruptions (-)
Outcomes (RQ3)	1. Organizational development	Structural innovations Pedagogical innovations Innovation practices
	2. Professional growth	Pedagogical competence Epistemic fluency Systemic understanding

***Table 5**: Composite variable solution with factor loadings and Cronbach* α

Sum variable	Item	Factor Loadings			
		1	2	3	4
1. Collaboration with school leadership and colleagues	10.9 Focused on development objects that are in line with the objects of our school and the municipality	0.795	0.355		
	10.7 Been able to influence the decision-making regarding the development of our school	0.785	0.365		
	10.8 Been consulted in matters concerning the development of teaching	0.749	0.427		
	9.6 Prioritized development objects	0.708			0.427
	9.7 Produced new practical solutions with teachers and school management	0.679		0.394	0.336
	9.3 Discussed issues related to the development objects with the school leadership	0.671		0.393	0.444
	10.1 Assessed the achievement of development objects in cooperation with the school's leadership and teachers	0.669			0.381
	9.1 Discussed issues related to the development object with colleagues	0.626		0.398	0.366
	9.5 Set common goals for co-development	0.621			0.588
2. Collaboration with external experts and guiding factors	9.14 Got to know new actors outside the school		0.772	0.370	
	9.13 Collaborated with experts outside the school		0.747	0.379	
	10.6 Taken into account the research results of the field	0.437	0.658		
	10.10 Received necessary information about the nature and progress of the development work	0.479	0.601		0.356
	10.5 Taken into account the teachers' needs and wishes identified in the initial phase of the co-development process	0.527	0.588		0.382
	10.4 Taken into account teachers' competences mapped in the initial phase of the co-development process	0.406	0.556		
	9.15 Familiarized with the good practices of other schools relating to the development object		0.516	0.316	0.376
3. Collaboration with pupils and homes	9.4 Discussed issues related to the co-development process with students			0.820	
	9.8 Produced new practical solutions with students			0.810	
	9.12 Cooperated with homes		0.433	0.763	
	10.3 Evaluated the outcomes of the development objects with the students		0.478	0.669	
	9.11 Tested the developed solutions together with the students		0.432	0.613	
4. Collaboration with researchers	9.2 Discussed issues related to the development objects with researchers	0.313	0.320		0.771
	9.9 Produced new practical solutions with researchers		0.399		0.741
	10.2 Assessed the achievement of the development objects with researchers	0.394	0.350		0.714
	Cronbach's α	***.956***	***.903***	***.889***	***.922***

Table 6: *Key implementation factors of the collaborative school development process according to the educators*

Key implementation factor	Aspects experienced as fostering (+) or hindering (-)	Illustrative excerpt from interviews
1. Practice integration	Resources (+)	It is not assumed that anyone does it [development work] in their own time, instead the time is specifically budgeted from the school's common time (School B, teacher with a developer role)*
	Segregation of roles (-)	It seems to me that the management team is probably very aware of this [development work], and that information has not really been spread out so much to the rest of the school community. It has remained a little bit of a matter for their small circle, which has been such a shame. And maybe I feel that since I have not been part of the management team, I feel that 90 percent of the things in this project have been kept from me. (B4)
	Communication (-)	The flow of information has been very intermittent and even completely non-existent. (School C, teacher without a developer role)
2. Joint work	Practice-driven approach (+)	It has been wonderful that this (co-development project) wasn't anything like new, but the starting point was specifically our requirements. In my opinion, we have been listened to, indeed the original idea was "let's start with our needs". And I find it has worked out really well. (A3) The entire working community was heard and could anonymously comment and make suggestions. All in all, our views and opinions were listened to. (School C, teacher with a developer role)*
	Multi-professional collaboration (+)	I feel that we as teachers and as a school have been taken really good care of, and we've been offered high-quality help. What has surprised me the most, is how practical level the support we've received has been, not just guidance and inquiries, but solutions have actually been searched and found together – sometimes it feels even as a gift. (School A, teacher with developer role)*
	Development orientation (+)	We have a very active and innovative teaching staff, and I find that we have that kind of committed participation among us. And that all the ideas that are being raised, I aim to listen to. Well, I claim that we're always carried away by something that we are inspired to do. And then we've had the idea that we're always taking on something new that in some way touches everyone. In other words, we always have the same kind of common commitment and the initial start towards new projects. (A1)
3. Contextual circumstances	Digital-pedagogical foundations (-)	But then, when it's not only in your own hands how it can be done, and whether there are devices and other things, that causes a lot of… all sorts of possible issues. (…) And of course, the ideas are really good, like enhancing children's digital skills, but we just don't have equipment for it at the level that you could use them. There are also discussions about equality and so on. (A4)
	External disruptions (-)	Because of Covid, it has been a bit sad that all the meetings have been remote, then there is not the same kind of discussion as in life. (School B, teacher without a developer role)*

*excerpts from open-ended questionnaire responses.

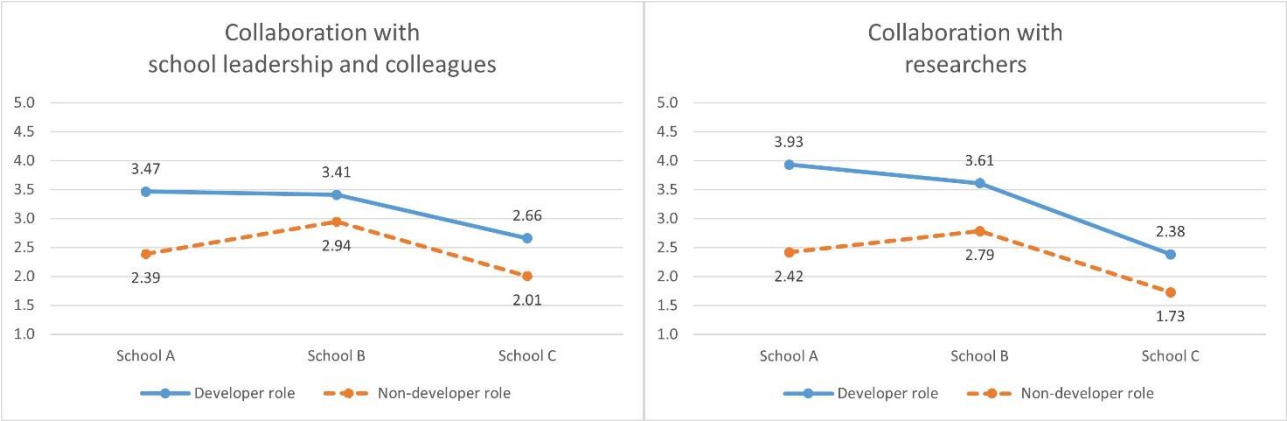


Figure 2: *Stakeholder collaboration per teacher roles.*

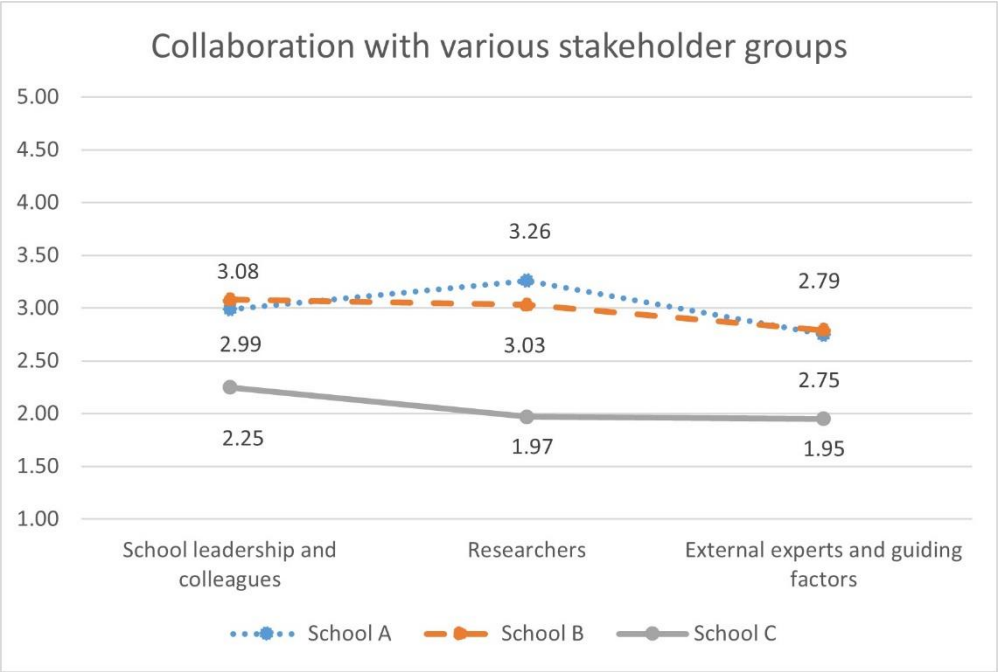


Figure 3: *Stakeholder collaboration per schools.*