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K-ULF- an agile model for participatory practitioner-based research in STEM education

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Abstract

This extended abstract describes a project which develops STEM education, and a social justice and equal opportunity agenda, in which the school's egalitarian mission is seen as an imperative to support every child regardless of background. The K-ULF project (compensatory teaching and learning through practice-lead research¹) takes an exploratory approach in developing and evaluating models for participatory practice-lead research. The initiative is a joint venture between academia and the Swedish school system. Traditionally teachers have been seen more as the objects of study, rather than active agents in the creation of research questions, design or even results. The growing interest in evidence informed practice is gaining ground internationally, however the results of earlier studies may not always be relevant or when relevant not embedded in the learning and school culture in which they are used. The need for arenas where academia and practice collaborate, co-create, and learn from each other is desperately needed. Our aim is to develop models for participatory collaborative research where both researchers and teachers contribute, share, and create knowledge together. This approach has huge potential in terms of strengthening the research base for educational practices in schools and integrating the teaching profession and its development through collaboration with research and teacher education. K-ULF contributes to making research more relevant for educational practice in STEM education. The conference presentation presents the K-ULF model and its agile structure, inviting the audience to recontextualise our research into their own setting.

Extended abstract

Introduction

Swedish education is required to be based on the basis of educational research and proven experience. Hence, evidence should inform teachers' classroom practices. However, the extent to which this happens is limited in practice due to pressure on teaching time. As a strategy to increase access to relevant research, and to enhance conformance with these legal requirements mandating evidence informed practice in schools, the Swedish Government launched a national pilot (ULF-avtal) with the intent to develop a long-term sustainable model within which academia and schools can co-create in terms of research and classroom innovation beyond the traditional level and on equal ground. ULF is the acronym for Utveckling (Development) Lärande (Learning) and Forskning (Research) and provides long term national funding for practice-lead research in schools.

The piloting of different models for participatory practitioner-based research commenced in 2017 and was initially commissioned as a four-year trial project. However, after evaluation of the first phase the Swedish Government decided to extend the process of piloting a range of different models to the end of 2024. A full implementation of a long-term initiative has been funded starting from 2025. Several pilot research models have been developed and evaluated within the national initiative, one of these is K-ULF.

The K-ULF model [the Swedish acronym stands for (Kompensatorisk Undervisning för Lärande och Forskning), which is a play on words in relation to the acronym for the national initiative (ULF). More importantly, however, is the emphasis on the egalitarian mission in the schools, and the importance of high-quality instruction. Hence, the Compensatory Teaching for

Learning and Research model, K-ULF, which emphasises scholarship of teaching and learning as a means with which to strengthen the scientific basis, and impact of professional experience, on K-12 STEM education. Three themes dominate the challenges faced by the schools involved: digitalization, language development through practical work. The project has also a particular focus/emphasis on the learning/progression of male pupils, who have fallen behind in all national measures over the last decade. The reason for this may at first appear contradictory, as the common belief is there is a need to attract more girls to the STEM field. While this remains true at the international level, as well as the Swedish, recent evaluations reveal an acute need to support boys as a group, as they tend to fall behind girls overall through the educational system. The overarching themes and research questions in K-ULF, are grounded in the needs of the partner organisations. They are developed in dialogue with county boards of education, in reference to policy documents, and within teacher networks within the different partner organizations. Hence, themes do not derive entirely from the individual teachers' nor the research agendas of the participating academics. Instead, the research questions develop from common themes, firmly embedded in the contexts of the participating teachers' personal practices. Interventions and research questions are consequently refined in dialogue with other teachers, Master's Degree students and/or researchers from the teacher education program.

K-ULF involves two groups, one provides the strategic view with a focus on classroom sustainability and the other is an operative group considering the day-to-day engagement of teacher trainees, academics, and teachers. The strategic group consists of representative of the boards of education of partner institutions (policy level), who decide on strategy, anchoring the overarching fields, and

¹ This is a loose translation from the Swedish name of the project.

ensuring the school's overall quality work. The operative working group provides different functions, including teachers in schools, teacher trainees, junior and senior researchers, school board members, Master's, and PhD students, all working together in an agile project environment in response to participants needs.

Results and discussion

The K-ULF model has proven very successful - as highlighted by the national project's external evaluators, who conclude that "they seem to have created something beyond regular partnership. Instead, they seem to have developed a new arena with an alternative role distribution unlike what traditional research projects or partnership projects usually allow. An agile project structure without clearly defined actors, common questions and predefined sub-projects, that traditional research projects usually have. Overarching themes and questions have been developed, researchers and project managers are stable actors, and the sub-projects with associated actors are more in flux, depending on the commitment of teachers and teacher students involved."

There is an international imperative, and a need to identify sustainable models for practice-lead research in education is considerable, as there are no established models for practical research in education, in contrast to long standing traditions in medicine and health care. K-ULF contributes to filling that gap developing models that deliver new knowledge and insight on how to design participatory practice-based research. Our project provides new insights, and builds on previously reported outcomes (Hartell, et al, 2022). This presentation focuses primarily on the adaptable/agile project structure and shares some recent successes and challenges deriving from the K-ULF model, which have international significance for STEM - education.

Results from the first three years with K-ULF provide examples of the impact achieved by various aspects of the project. We emphasise our organisational successes and challenges, how to capture relevant themes and research questions, as well as the importance of communicating the results to all levels of the partner organizations. We find that the organization of the work in the strategic and the operational groups of K-ULF have been successful. However, we see a need to strengthen the participation at all levels in the partner organizations, and especially with school management, such as school principals. Anchoring our initiatives in the context of the school's systematic quality assurance activity is vital, and to accomplish that the involvement and engagement of the participating schools' management is a key component. The missing link is at this level, as we have other parties such as school boards and teachers already clearly involved. Communication is central, both in terms of obtaining input on relevant research questions, as well as in disseminating the results to schools, and finally embedding the outcomes in the school's ongoing systematic quality assurance activities.

Conclusion

K-ULF has deliberately involved representatives from boards of education and teachers in schools in systematic practice-lead research and development. Strengthening the

engagement in K-ULF among the local school boards has been identified as the missing link between boardroom and classroom and overarching systematic quality assurance activities. Therefore, we identify a need to further improve the communication and share the responsibility to gather current research themes and communicate the results within our network of partner organisations. Another need we identified was to ensure long-term financing. Up to the present (2022) we have distributed additional funding (4.5 M SEK for 2020–2022) from Uppsala ULF-avtal to schools to enhance the opportunity for teachers to participate. The Swedish Government has decided that models developed within the ULF-avtal will be permanently implemented from 2025, however the details are not yet fully specified.

The K-ULF model has been developed within the context of the double degree program for teacher-engineers at the KTH Royal Institute of Technology and their five partner municipalities. The presentation at the conference elaborates the K-ULF model and invites the audience to contextualise our findings.

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