Systems Leadership for Learning

A framework for development cooperation in education

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1. Introduction

The ideas presented in this document evolved between early 2017 and early/mid-2019, in an effort to consolidate my own thinking into a coherent set of processes; processes that could be used in the work undertaken by Open Development & Education (<u>https://opendeved.net</u>) as well as in the preparation for the EdTech Hub (<u>https://edtechhub.org</u>).

The motivation for this is the fact that approaches to (the management of) international cooperation and international development are often not published. One significant exception to this is GIZ's Capacity Works, which includes details on the GIZ approach, as well as a range of practical activities used in this approach. Another example are the Principles for Digital Development. However, while there is documentation, this document is nowhere as extensive or coherent as GIZ's Capacity Works. There are of course other theories (such as systems theories, e.g., RISE ideas on accountability¹), but such ideas are not necessarily practical in nature or supported by implementation activities.

One might ask whether there is an actual shortage of such materials or whether it is just the case that these materials are not shared publicly. However, approaches encountered in the field — even when they concern evaluation activities — are often not particularly well documented internally either (e.g., through internal documents, a clear Theory of Change, etc).

In this document, we put forward a system's version of Leadership for Learning — "Systems Leadership for Learning" — as an emergent management approach that is both utilised as well as shaped by our consultancy work. Our consultancy work, initially in the area of teacher professional development, extended more and more towards working at a national level. Being aware of Leadership for Learning, and applying this with teachers initially, we also found the model helpful when working such national levels, and eventually arrived at the idea of Systems Leadership for Learning described here.

2. Core ideas

At the centre of our approach is a participatory 'shared working experience' and experimentation with learning — facilitating action-orientated active learning, reflection and redesign aimed at creating new participatory learning cultures within the international development and cooperation sector. As a consultancy approach, this is not a given: Other types of consultancy and 'technical support' are possible. However, in our strife for sustainable transformation of education systems, 'consultancy from afar' has limited impact. An essential part of creating such working experience is actually working together — shared labour and shared labouring² — linked to solving practical development problems. Within this, monitoring/evaluation is not a separate activity but becomes a mode of enquiry ('multi-loop learning').

¹ <u>https://www.riseprogramme.org/</u>

² The term 'shared labouring' was introduced to me by Susan Robertson, <u>https://www.educ.cam.ac.uk/people/staff/robertson/</u>.

In an unsuccessful proposal (in 2017) in conjunction with Susan Robertson and the Faculty of Education (University of Cambridge), we once put this as:

"Building reflective and reflexive learning capability has the potential to affect deep, sustainable and scalable change leading to new cultures of knowledge production. Our approach includes cycles of design, experimentation, reflection and redesign. Within this, a high threshold of challenge aims to disrupt existing rigid working and learning cultures. Committed to collaborative design, we repurpose the ways in which time and resources are used, reworking individual learning relationships, programmes and institutions."

Such ideas resonate with a wide range of established education approaches, but also resonate with current ideas in the international development community (agile processes, adaptive management, open development, distributed leadership, Digital Principles).

Working in international development, our overall aspiration is for sustainable, scalable development impact in the priority areas identified by the Sustainable Development Goals. Working on various bids for major programmes, the following items represent a stream of consciousness of anything that felt relevant.

Figure 1. Our ideas space

Sustainable Development Goals; Sustainable Development Goal 4; Equity — Inclusion — Capabilities/freedoms, also in research; children's voices and participation; Education for All; quality education for all; starting with the marginalised rather than hoping for trickle down; Openness — Transparency — Integrity; open content, open access, open data, open research, open IP, open innovation; Leadership; education leadership; Leadership for Learning; Lundvall; National Systems of Innovation; innovating together; DUI vs. STI; Arocena and Sutz; iterating; agile; squadification; adapting; social innovation; technology innovation; design-based research; design-based implementation research; nimble RCTs; Education Endowment Foundation Toolkit; fail fast; minimum viability; lean; lean impact; PDIA; accountability; Equitable working environments; autonomy mastery purpose; equitable technology use; technology that impacts all marginalised; meaning of equity; Doing Development Differently; DFID ... Digital Strategy 2019, Education Policy 2018, enhanced open access policy; user testing; consensus; consensus-based decision making; distributed learning; capacity works; Principles for Digital Development.

This is a broad set of ideas, that cannot be put into practice from one day to another. Moreover, those ideas are evolving. Therefore, it seems that the process of learning while you practice (i.e., work or labour together) is paramount, which make the connection with Leadership for Learning. The focus on learning (of the sector, of our organisation, of individuals) is paramount; this learning needs to be made explicit and discussable, so that it can be shared and be subject to evidence-based processes.

3. Systems Leadership for Learning (SLL)

Systems Leadership for Learning (SLL; see Table 1 below), is inspired by the Leadership for Learning approach. SLL reframes the five Leadership for Learning principles from a systems perspective (P1–P5), drawing out specific aspects that are particularly relevant for systems perspectives in education within international cooperation and development (A1–A3).

It is important to note that Systems Leadership for Learning is merely inspired by the school-based Leadership for Learning approach. My own experience of the widely used Leadership for Learning approach is cursory and only through teacher development, rather than, e.g., school management. Systems Leadership for Learning needs to be seen as only loosely connected to Leadership for Learning, and something that sites outside the school improvement tradition. It so happened that the five Leadership for Learning principles were useful in my consultancy work.

It is also important to note that, rather than constituting a theoretical framework, SLL seeks to be a practical approach that ultimately promotes better development outcomes. SLL was conceived and developed in education contexts and may therefore be seen to primarily apply to cooperation activities focussing on education development. However, SLL does apply to adult learning and would therefore be applicable to any development activities where adult learning is relevant.

SLL also integrates aspects of current program management models (A3), such as adaptive management and agile processes. SLL further integrates with the 'learning organisations' narratives, such as "Monitor — Evaluate — Learn (— Adapt — Implement)". However, SLL does not abandon established approaches stemming from education and education research in favour of new approaches stemming from other disciplines (such as agile software development). Rather, SLL builds on established education approaches and utilises developments from other disciplines to extend and refine. Such other disciplines that SLL builds on of course include recent trends in international development ('adaptive', 'agile', 'lean'); further, it does include learning from other sectors, such as Lundvall's work (2012) on learning in innovation systems and the 'learning economy'.

The principles of SLL are outlined in Figure 2 below, while the remainder of this document provides examples for and interpretation of these principles.

The Systems Leadership for Learning (SLL) approach

The five principles:

- P1. **Systems become effective through a pervasive focus on learning.** Everyone is a learner; learning is relevant to, and focuses on, all aspects of the system; learning is reflective and reflexive (*"multi-loop"*).
- P2. **Systems must explicitly create the conditions for learning.** Creating physical and digital social spaces that stimulate and celebrate learning is necessary to enable a pervasive focus on learning; *"creating conditions"* means creating conditions for both self and others, throughout the system and beyond.
- P3. Learning dialogue is essential for effective change and innovation. Learning and insights are made explicit, discussable and transferable; *"making explicit"* includes tools (such as questioning), as well as generating tangible outputs that are accessible to others.
- P4. Leadership and responsibility are shared throughout the system. Responsibility includes the responsibility for maintaining the focus on learning and programme change accordingly; maintaining the focus on learning keeps the system lean by discarding elements not to do with learning.
- P5. **All aspects of the system are mutually accountable.** Evidence-based insights and transparent sharing of such insights (e.g., transparency for the learning achieved) are foregrounded.

The three aspects:

- A1. **Equity, gender, and inclusion are foregrounded.** As an approach for international education development and cooperation, SLL includes an explicit focus on equity, including socio-economic status, gender and disability, within the wider framework of the Universal Declaration of Human Rights, the UN Convention on the Rights of the Child and the Sustainable Development Goals.
- A2. **Digital processes and digital technology** will inevitably operate in some parts of the system. All five principles must recognise this, and pay attention to how digital processes and technologies need to be utilised to achieve project goals; for example using digital processes to create transparency (systems accountability), promote (digitally mediated) dialogue and participation, and consider how 'digital' creates conditions for shared learning ('open education / content / data', 'distributed learning', Principles for Digital Development, etc).
- A3. **The impact of complex systems is unpredictable.** Processes must be broken down into defined sub-processes and iterations, allowing reflective and reflexive learning (multi-loop learning, the principle of incremental improvement, DBIR: Design-based Implementation Research, agile retrospective). Insights are allowed to effect change (adaptive, evidence-based management).

4. Systems Leadership for Learning: An example

Figure #3 below presents an overview of digital and non-digital aspects of a system in one of our areas of expertise: digital technology, applied to a teacher education programme. In Figure #3 the arrows represent dependencies within the implementation, but could also form a first iteration of a Theory of Change or be the starting point for a causal loop diagram. Note that systems do not have hard boundaries (Arrows 14).

Leadership for Learning model would normally be to the dependencies illustrated by Boxes 5a, 6a, 7a and 8, back to Box 5a. SLL expands this to the whole system, including the upper part of the diagram (Boxes 1, 2, 3, 4; as well as arrow 9, and boxes 10–14). Here, P1 ('focus on learning') includes programme managers as learners; P2 means creating spaces for professional development within the programme; P3 means engagement with Open Access, Open Research, etc

Equity, gender and inclusion (A1) are foregrounded not only in relation to the direct beneficiaries but also with the programme itself. For example, do younger staff members have the ability to progress on the basis of merit? Do female staff members have access to the same opportunities for progression as male staff members?

SLL also considers the relevance of 'digital' (A2), such as the appropriate use of digital tools and equitable benefit. One of the significant issues in the use of digital technology in education in low-income countries is determining the key returns on investment for ICT use. For example, how do these routes compare:

- 1. EdTech to teach ICT in the classroom: $5b \rightarrow 6b \rightarrow 7c$,
- 2. EdTech to teach, e.g., science and maths: $5b \rightarrow 6a \rightarrow 7a$,
- 3. EdTech for teacher development only: $5b \rightarrow 6b \rightarrow 7b$.

Historically, route 1 has been dominant; however, routes 2 and 3 are more productive, and route 3 may have the highest VfM for children's learning outcomes. However, unlike the UK, where the Education Endowment Foundation offers some guidance on the positioning of digital technology in the classroom,³ no such comparable evidence is available in low-income countries.⁴

Tools like the Principles for Digital Development are often considered to be relevant only for specific digital programme outputs (such as a 'website'). In SLL, 'digital' applies across the system, including programme management and uptake (Arrows 14).

³ <u>https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit</u>; The EEF, and indeed Hattie's visible learning offer some important guidance.However, RCTs and indeed

meta-analysis have limitations, see, e.g., Wrigley, T. (2018). The power of 'evidence': Reliable science or a set of blunt tools? *British Educational Research Journal*, *44*(3), 359–376. <u>https://doi.org/10.1002/berj.3338</u> (and references therein).

⁴ E.g., Haßler, B., Hennessy, S. & Hofmann, R. (2018). Sustaining and Scaling Pedagogic Innovation in Sub-Saharan Africa: Grounded Insights For Teacher Professional Development. Journal of Learning for Development — JL4D, 5(1). Retrieved from <u>http://jl4d.org/index.php/ejl4d/article/view/264</u>

Figure 3. Digital and non-digital aspects of a system focussing on teacher professional development.



5. Focus on learning with technology

Having examined one particular set of interactions, we now focus on comparing different possible systems regarding learning outcomes. The ultimate goal of this particular approach is to promote more effective cooperation to achieve equitable education (SDG4/EfA, c.f. SLL Principle 1, focus on learning). This sets it apart from more general approaches (such as 'capacity works' or the PDDs), which seek effective development more generally (e.g., all SDGs). As mentioned above, 'focus on learning' does not just mean pupil learning. However, as it does *include* pupil learning. We therefore need to gain clarity as to what effective learning means and identify the locations where learning takes place.

4.1. Classroom interventions in the UK and the Education Endowment Foundation

The aim of our work is to answer the question with outputs that provide clear guidance for decision makers (national governments, funders, NGOs etc). We note the work of the Education Endowment Foundation in the UK, and their <u>toolkit</u>, which presents classroom interventions (*"proximate determinants"*, Pritchett, 2015) listed against effectiveness, cost and security of the evidence.

For example, metacognition has very high impact and very low cost (with secure evidence). In other words, a Theory of Change that features *"increased metacognition leading to improved learning outcomes"* is backed by evidence. By comparison, 'early years interventions' have moderate impact and very high cost (with secure evidence). Digital technology is ranked as moderate impact for moderate cost (with secure evidence). Theories of Change that rely on early years and digital technology, but ignore metacognition would be subject to criticism.

"Learning styles" (still used in the design of teacher programmes) has very low cost, but also low impact and limited evidence. A Theory of Change relying on this mechanism would have to argue carefully why such an approach is useful. Summer schools (out-of-school-time interventions, typically in breaks) have low impact for moderate costs, but based on extensive evidence. A Theory of Change suggesting summer schools as a cost-effective way to raise learning outcomes, would run counter to UK-based evidence. Unless there are contextual factors that significantly change the UK-based analysis, such a Theory of Change would need to be discarded.

4.2. A wider focus: Education systems interventions

The EEF focus on classroom interventions is appropriate in the UK, where the wider system factors — while important — are not debilitating.⁵ However, in LMICs, given the lack of progress in education (and in many cases deterioration, despite decades of international aids), points towards the need for a holistic systems approach (including *"system determinants"*, *"contextual efficacy"*, *"political determinants"*, Pritchett, 2015). A table, similar to the EEF toolkit, but for systems interventions (in LMICs, including educational technology at different levels, focussing on marginalised groups) is shown below, to illustrate processes to be considered in the

⁵ For a comparison of settings, see Björn Haßler, Sophia D'Angelo, Hannah Walker & Melissa Marsden (October, 2019). "Synthesis of Reviews on Teacher Professional Development in Sub-Saharan Africa With a Focus on Mathematics." Open Development and Education, Cambridge, UK. Version 2. DOI: 10.5281/zenodo.3497271. Creative Commons Attribution 4.0.

light of our overall research question. This of course includes classroom interventions as part of wider systems interventions.

Level 1: Classroom. Route A shows a scenario that does not represent VfM impact on learning. Even in high-income countries, there is little clear evidence that 1:1 scenarios have particular learning gains. In fact, the opposite may be the case (c.f., Haßler, Major, Hennessy, 2015). Moreover, as the EEF indicates, while the use of digital technology in the classroom does have moderate impact, there are other interventions (e.g., metacognition) that have higher impact and lower cost. Moreover, while digital technology in the UK has a moderate cost, this cost is likely to be higher in LMICs. The promotion of metacognition on the other hand, is likely to have similar cost to what it is in the UK. It is important to back this up through literature review and cost-analysis. However, the case is sufficiently clear to make primary research unnecessary.





A more promising mode is route B1: technology is used in the classroom, but where it has the highest impact on learning gains. This means sparing use of technology, where there is a clear advantage over non-technology-based scenarios. This would include for example tackling common misconceptions in mathematics. This area needs research, to identify the exact payoff of technology-use, how to make technology robust so it can serve the most marginalised, etc. Such research could take the form of design experiments (e.g., Design-based Implementation Research). Also the question of a good balance of VFM vs. effectiveness for uses of tech in the classroom are, i.e., how often a week tech is used, for what subjects/topics, with what emphasis.

This also needs to be compared to tech at the teacher level, and 'digital' at the systemic level (which Includes the question of open).

Level 2: Teachers. Routes B1 and B2 start from the 'low point' of little impact on learning and medium cost. At the start of route B2, cascade models are situated. Despite widespread evidence that these are not effective, they are still widely used. Along route B2, TPD model is changed towards more effective models (Haßler, Hennessy, Hofmann, 2018). School-based TPD models improve VfM and impact on learning gains (for children). They may include technology use at the teacher level.

Route B2 will require sequential mixed-methods approaches, that deliver secure outcomes through experimental and quasi-experimental designs, but have explanatory power through qualitative approaches, including classroom observation. Overall, such an approach would include multi-arm mixed-methods research, e.g., comparing teacher education with, with tech, and with, without classroom technology. Such studies need to be able to determine the differential benefit of technology (at various system levels), in comparison with other relevant wider factors (such as facilitator preparation overall facilitator supply) is also investigated. Further, systemic capacity for making sbTPD decisions (including local research capacity), and how it can be built needs to be considered.

Level 3: Ministry. Route B3 considers wider systemic interventions, such as an open curriculum together with open classroom materials. In the USA there are indications that this might lower costs by 80%, or, equivalently, providing a 5-fold increase of access to high quality education. This needs to be considered from the perspective of the most marginalised, to determine whether similar models can lead to similarly increased access to education. Moreover, to implement such new, radically open approaches may conflict with vested interests at various levels (including national governments, funders, implementers, NGOs). Creating space for innovation and professional development (Lundvall; Arocena and Sutz) are possible paths, that need to be validated through design experiments.

Wider system factors. Routes B1–B3 only represent part of the system, and other aspects need to be considered (c.f. Figure #3 above). For example, systems change needs to be evidence-based and thus supported by M&E outcomes (using ICT, possibly in near-real time) leading to improvements in interventions, policy change, etc. (Route C). However, the table clearly does not capture the whole system, which includes educational technology research. Regarding educational technology research, we need to ask further questions, such as the open and timely availability of outputs, compliance with open access requirements, research processes complying with best practices,⁶ sharing and utilising open data (now associated with increases of GDP), professional learning for researchers, as well as how funding is allocated to research. Such questions need to be answered through various types of analysis, drawing on ideas stemming from Iterative Best-Evidence Synthesis.

Returning to the above table, we stipulate that at the end of routes B1–B3 and C we have a point (labeled *"high"*) with high impact on learning and good VfM. However, this remains speculative.

⁶ Such as registration of experiments: This is accepted practice in health, where, e.g., RCTs without registration are unthinkable. By contract, education RCTs are rarely registered, casting doubt on validity.

Mapping exercises⁷ demonstrated that there are many areas where the evidence base regarding education technology is limited. The evidence base for the sector is not sufficiently mature for the map to be used systematically to identify priority future research questions. In light of this, the list of research questions below focuses on emerging areas that may be of particular interest for research within the ed-tech hub. Each is included because of the lack of current evidence and the pertinence of the topic in contributing to DFID's education agenda more broadly.

6. Creating the conditions for learning

Creating the conditions for learning in international cooperation does not just mean learning about research outcomes, but it also means learning about research together. Ideas for how this might happen were shaped partially through two unsuccessful project proposals (DFID-SPHEIR in 2017, eCubed in 2018), leading to the idea of 'systemic mixed-methods research'.

In the earlier proposal (Haßler, 2018), we complemented traditional mixed methods (qualitative/quantitativ) with design-based implementation research (DBIR, Penuel et al.). This allows both long-term evaluation as well as as shorter (adaptive/agile) cycles shape the programme. However, we also proposed to use DBIR at two levels. School-level DBIR (sDBIR), is used to evolve a TPD programme, and while programme/systems-level DBIR (pDBIR) is used to formally examine how a research implementation programme works, how it may need to be changed, and how it can be made replicable (see labels 'pDBIR' and 'sDBIR' in Haßler, 2018). The pDBIR typically focuses on wider aspects, especially where capacity building is needed. In other words, pDBIR explicitly creates the conditions for learning of researchers.

Figure 5. Two key factors in systemic mixed-methods research.

Systemic mixed-methods research extends mixed-methods research by

- seeking to strengthen the connections between mixed-methods research with design-based research; in other words, to appropriately draw on conventional qualitative and quantitative approaches with design-based research and design thinking, offering a range of iterative, design-based approaches;
- (2) by considering the research programme (including all programme activities) to be subject to (reflexive) systemic mixed-methods research at research-programme level and considering the research programme itself as an integral part of the wider system research, typically employing design-based methods.

The idea of systemic mixed-methods research was later utilised in a successful proposal (the EdTech Hub in 2019).⁸

⁷ Muyoya, C., Brugha, M. & Hollow, D. (2016). Education Technology Map: Guidance Document. *United Kingdom: Jigsaw Consult*. (2339240:TE5NDYPK;2405685:PLYXAFQY).

⁸ Available at <u>https://doi.org/10.5281/zenodo.3377829</u>.

6. Learning dialogue enabled by 'open'

While learning dialogue may well be personal face-to-face dialogue, another important aspect of this is the remote dialogue with others — enabling others to build on existing outcomes. Open licensing plays and important role (open content, open source software, open data) as do other affordances. This is not expanded here, as it is documented elsewhere (c.f., Haßler and Mays, 2014).

7. Conclusion: Operationalising SLL

While I hope that the notes above offer some insights, it may be argued that they are tingIt might be argued that the notes above are of a descriptive nature. My intention is to publish some of the practical exercises involved in this work in the near future (2020), and this article will be updated with references accordingly.

The Google Doc for this article is available at: Haßler 2019. Systems Leadership for Learning (10.5281/zenodo.2626705), and comments are welcome.

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References

- Cobb, P., Confrey, J., DiSessa, A., Lehrer, R. & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, *32*(1), 9–13. Retrieved from http://journals.sagepub.com/doi/abs/10.3102/0013189X032001009
- Bamberger, M. (2012). Introduction To Mixed Methods In Impact Evaluation. Retrieved from https://www.betterevaluation.org/en/resources/guides/intro_mixed-methods_impact-eval uation
- Fishman, B. J., Penuel, W. R., Allen, A.-R., Cheng, B. H. & Sabelli, N. (2013). Design-based implementation research: An emerging model for transforming the relationship of research and practice. *National Society for the Study of Education*, *112*(2), 136–156. Retrieved from https://www.sri.com/sites/default/files/publications/fishman_penuel_allen_cheng.

https://www.sri.com/sites/default/files/publications/fishman_penuel_allen_cheng_sabelli_ 2013.pdf

- Haßler, B. (2018). WRAHA: We Refugees Also Have Ambitions! Research design for an unsuccessful eCubed application. https://doi.org/10.5281/zenodo.3595400
- Haßler, B., Hennessy, S. & Cross, A. (2014). School-based professional development in a developing context: Lessons learnt from a case study in Zambia. *Professional Development in Education*, 1–20. https://doi.org/10.1080/19415257.2014.938355
- Haßler, B., Hennessy, S. & Hofmann, R. (2017). Sustaining and Scaling Pedagogic Innovation in Sub-Saharan Africa: Grounded Insights For Teacher Professional Development.
- Haßler, B. & Jackson, A. M. (2010). Bridging the Bandwidth Gap: Open Educational Resources and the Digital Divide. *IEEE Transactions on Learning Technologies*, *3*(2), 110–115. Retrieved from http://bjohas.de/wiki/Bridging_the_Bandwidth_Gap_-_OER_and_the_Digital_Divide
- Haßler, B., Major, L., Warwick, P., Watson, S., Hennessy, S. & Nichol, B. (2016). Perspectives on Technology, Resources and Learning — Productive Classroom Practices, Effective Teacher Professional Development. Faculty of Education, University of Cambridge. Retrieved from http://bjohas.de/Publications/Perspectives
- Haßler, B. & Mays, T. (2015). Open Content. In P. Hwa Ang & R. Mansell (Eds.), *International Encyclopedia of Digital Communication and Society*. Wiley-Blackwell. Retrieved from http://bjohas.de/Publications/Hassler_Mays_OpenContent
- Haßler, B., Neo, H. & Fraser, J. (2014). OER Guidance for Schools. Leicester City Council.
- Hennessy, S., Dreyer, J., Paulsen, R., Haßler, B., Loubser, C., Beardon, T. & Mays, T. (2014).
 Professional learning with ICT in the southern African context: The UNISA-Cambridge collaboration on Advanced Diplomas in Education. In *Prezi*. Johannesburg, South Africa.
 Retrieved from http://tinyurl.com/2014ICTsummit
- Lawrie, J., Hennessy, S., Haßler, B. & Bhandigadi, P. (2015). Use ICT to provide access to content, professional development and professional learning communities (Chapter 7). In M. Burns & J. Lawrie (Eds.), Where It's Needed Most: Quality Professional Development for All Teachers. New York, NY: Interagency Network for Education in Emergencies. Retrieved

from

http://www.ineesite.org/en/blog/new-publication-where-its-needed-most-quality-professi onal-development-for

- Lorenz, E. & Lundvall, B.-Å. (2011). Accounting for Creativity in the European Union: A multi-level analysis of individual competence, labour market structure, and systems of education and training. *Cambridge Journal of Economics*, *35*(2), 269–294. https://doi.org/10.1093/cje/beq014
- Lundvall, B.-Å. & Lema, R. (2014). Growth and structural change in Africa: development strategies for the learning economy. *African Journal of Science, Technology, Innovation and Development, 6*(5), 455–466. https://doi.org/10.1080/20421338.2014.979660
- Lundvall, B.-Å., Joseph, K. J., Chaminade, C. & Vang, J. (2011). *Handbook of innovation systems and developing countries: building domestic capabilities in a global setting*. Edward Elgar Publishing.
- Lundvall, B.-Å.. (2012). Post Script: Innovation System Research Where It Came From and Where It Might Go. In B.-A. Lundvall (Ed.), *National Systems of Innovation* (pp. 317–350). London: Anthem Press. https://doi.org/10.7135/UPO9781843318903.016
- Penuel, W. R., Fishman, B. J., Haugan Cheng, B. & Sabelli, N. (2011). Organizing Research and Development at the Intersection of Learning, Implementation, and Design. *Educational Researcher*, 40(7), 331–337. https://doi.org/10.3102/0013189X11421826
- Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007). *Teacher professional learning and development: Best evidence synthesis iteration*. Wellington: Ministry of Education www.minedu.govt.nz/goto/bestevidencesynthesis. Retrieved from http://www.minedu.govt.nz/goto/bestevidencesynthesis

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