Design of technology-enhanced learning (TEL) scenarios under the third generation cultural historical activity theory (CHAT)

Caroline Duret

hep/ haute école pédagogique vaud

UNIVERSITÉ CÔTE D'AZUR | LINE Laboratoire d'Innovation et Numérique pour l'éducation

@cduret

June 15 2022, Helsinki, Finland
NORDIC-BALTIC ISCAR 2022

Teacher educator

Haute Ecole Pédagogique Vaud, Lausanne, Switzerland

Unit of teaching & research : MI (Media, digital use and computer science)

PHD student under the supervision of Professor Margarida Romero

Université Côte d'Azur, Nice, France

LINE (Laboratoire d'Innovation et Numérique pour l'éducation)

FOREWORD

Reflections that have built the backbone of my doctoral research which focuses on teacher training for Technology-Enhanced Learning (TEL) :

- the main theoretical framework
Cultural Historical Activity theory (CHAT)

- the foundations of a formative intervention
inspired by the Change Laboratory methodology

- the main research question
How do teachers transform teaching and learning activity through card-based co-design of TEL scenarios ?




This presentation proposes to set out the theoretical arguments that lead to suggest, for in-service teacher training aiming at technology-enhanced learning, a formative intervention based on Learning Designlearning d activity.

Technology-enhanced learning (TEL) refers to the use of technology for teaching and learning, including digital literacy and citizenship (Giraudon et al., 2020).

Pedagogical integration of digital technology into teaching and learning remains an important educational challenge (Albion & Tondeur, 2018; Mishra & Koehler, 2006; Stockless & Villeneuve, 2017).

Teacher training is recognised to be one of the key factors in the integration of digital technology into teaching and learning (Fiévez, 2017; Stockless et al., 2018).

This research focuses on training modalities and strategies that can support in-service teachers in integrating digital technology into teaching and learning.

Main theoretical framework : third generation activity theory (Engeström, 2001, 2009).

Focus on Learning Designlearning activity as a system having as object the integration of technology-enhanced learning practices.

This research draws also on contributions of didactics and cognitive science in Learning Designlearning.

1 Third activity theory as a conceptual framework for questioning the development of teaching practices in relation to teacher education.

2 Learning DLearningesign activity as a central activity system for the integration of digital technology into teaching and learning.

3 A formative intervention based on Learninglearning Design activity of TEL scenarios.

Cultural Historical Activity Theory (CHAT)

“a practice-based [...] and future-oriented theory” (Sannino et al., 2009, p.3)

“a theory of transformation and development" (Lund & Eriksen, 2016, p.58)

“distinguished by its concern with qualitative transformations in human practice” (Yamazumi, 2013, p.63)

Transformative agency

Teachers

as change agents (Juutilainen et al., 2018; Morselli & Sannino, 2021; Priestley et al., 2012; Tao & Gao, 2017; van der Heijden et al., 2015)

can “act upon, influence, and transform their activities and circumstances” (Kumpulainen et al., 2018, p. 28), “in new and creative ways" (Toom et al., 2015, p. 615).

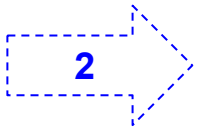
Expansive learning

Teachers can “construct a new object and concept for their collective activity, and implement this new object and concept in practice” (Engeström & Sannino, 2010, p.2).

In-service teacher training can be an opportunity for teachers to creatively transform their practices towards integration of digital technology and education in teaching and learning and “learn something that is not yet there” (Engeström & Sannino, 2010, p.2) through transformative agency (Engeström et al., 2020; Haapasaari et al., 2016; Sannino, 2015).

Epistemic and transformative approach

To design and study a formative intervention that engages teachers “in creative, transformative actions” and invites them to take up the "creative challenge of designing" (Sannino, 2013, p. 56) a new form of technology-enhanced teaching and learning, "by explicating and envisioning new possibilities"(Haapasaari et al., 2016, p. 233).



Focus on Learning Dlearningesign activity as a creative and agentive activity that can participate in an expansive learning process, for the integration of digital technology into teaching and learning.

Interplay between the activity systems of the student and the teacher

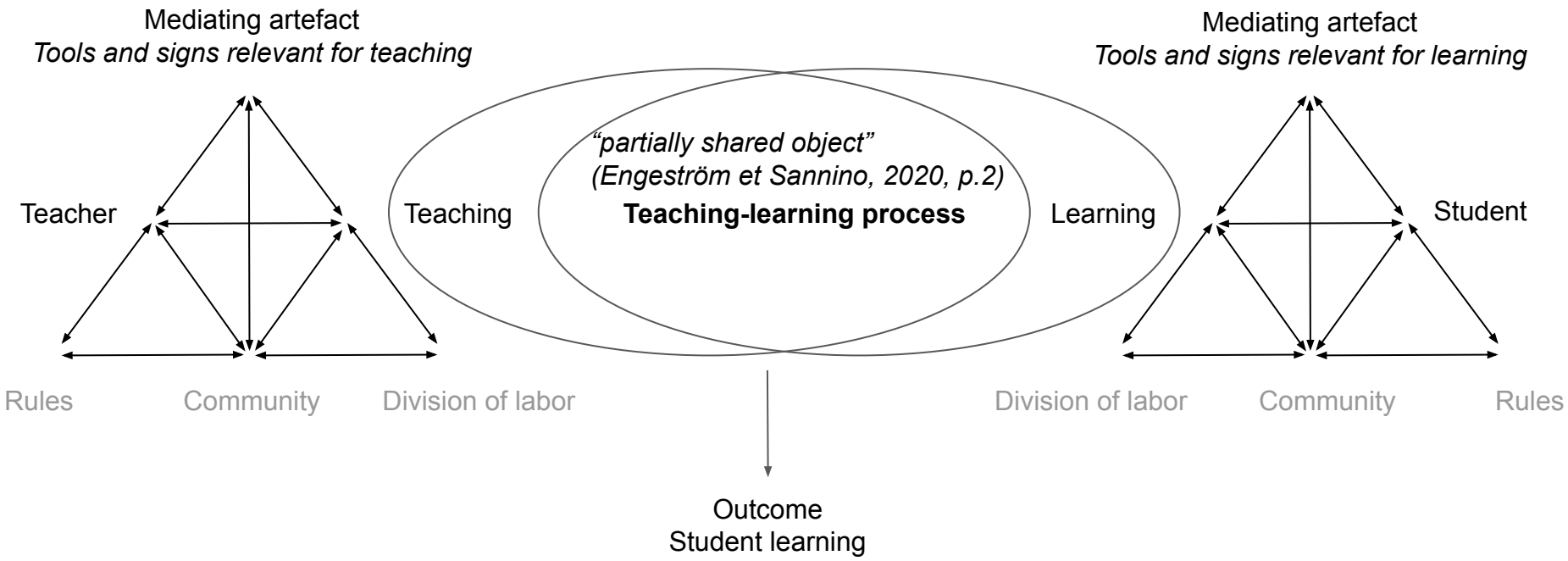
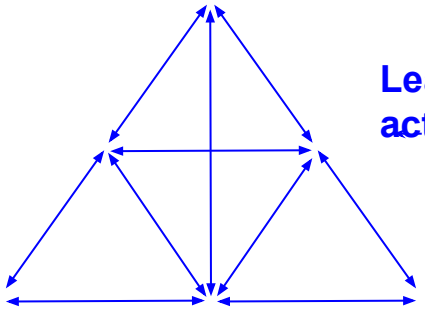


Figure 1. Interplay between the activity systems of the student and the teacher

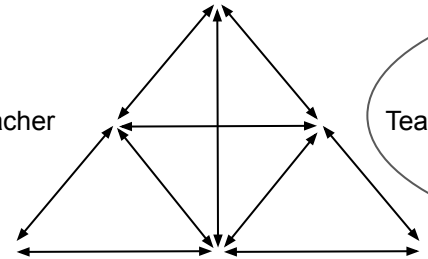
2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning



Learning DLearningesign activity

Mediating artefact
Tools and signs relevant for teaching

Mediating artefact
Tools and signs relevant for learning

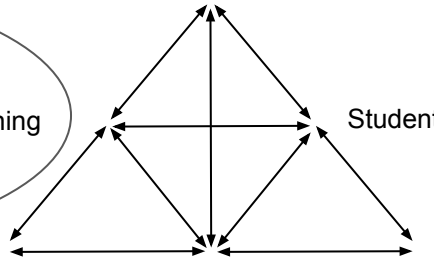


Teacher

Teaching

Teaching-learning process

Learning



Student

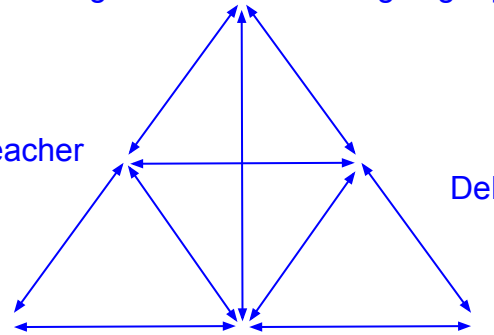
Outcome
Student learning

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

Learning DesignLearning activity as a creative activity for expansive learning

1st point

Tools and signs relevant for designing a pedagogical scenario



Learning
DeLearningsign

Outcome
Teaching-learning (pedagogical) scenario

Learning DLearningesign activity driven by the motive of "preparing teaching to support student learning" (Musial & Tricot, 2020, p. 10).

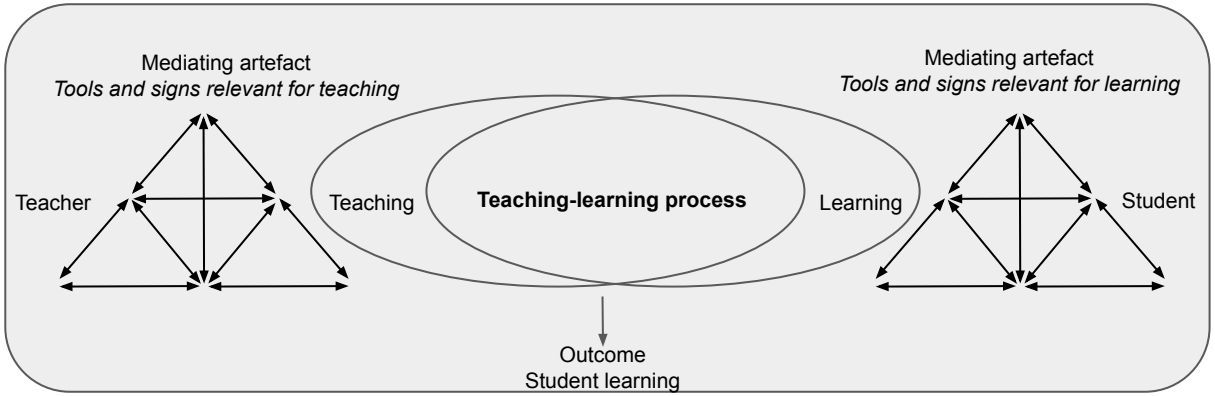
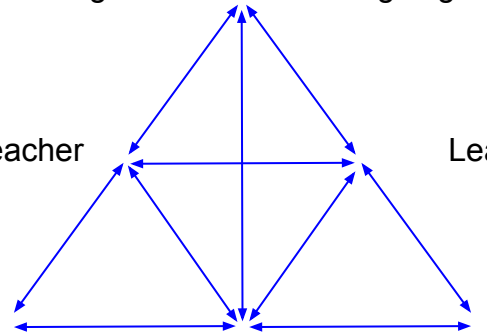


Figure 2. Interplay between the learning design activity and the systems of the student and the teacher

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

Tools and signs relevant for designing a pedagogical scenario



Teacher

Learning design

It aims at designing an activity in which the shared object, namely teaching-learning, is achieved.

Outcome

Teaching-learning (pedagogical) scenario

Set of actions and interactions between the subjects, teacher and students, and with the artefacts (knowledge, pedagogical approaches, material and digital tools) to bring about teaching-learning process

Learning DLearningesign activity driven by the motive of "preparing learning to support student learning" (Musial & Tricot, 2020, p. 10).

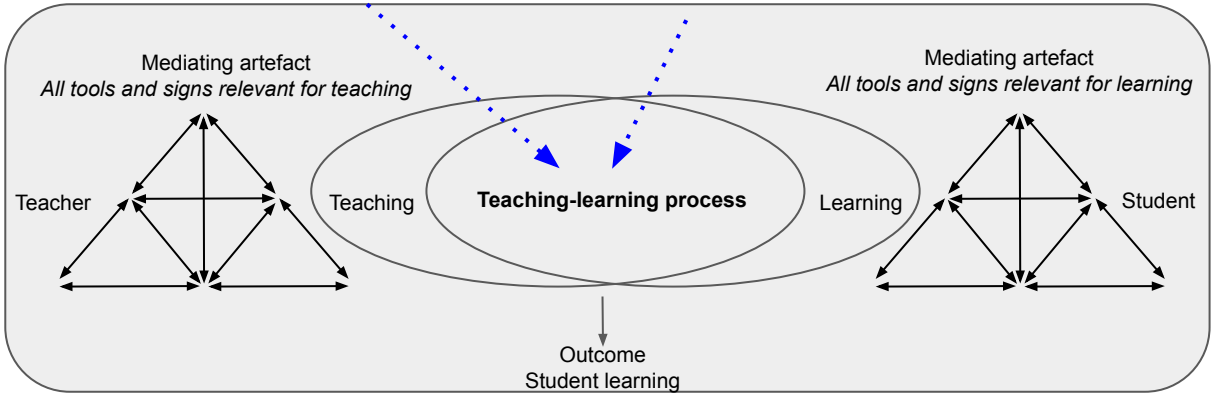


Figure 2. Interplay between the learning design activity and the systems of the student and the teacher

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

Learning design activity is a creative activity which requires

- a singular (unique) and new articulation of the different components integrated in the teaching-learning (pedagogical) scenario;

- the need for the creative solution, the teaching-learning scenario, to meet the requirements of value and efficiency (Romero et al., 2017).

Learning design activity can help generating new and context-specific solutions (Bonnardel & Lubart, 2019).

When designing pedagogical scenarios integrating digital technology, teachers are invited to create something new

- in terms of mediating artefacts, either for teaching or for learning, or for both together;

- in terms of practices that will enable to make use of technology in a way that adds pedagogical value to teaching and learning in their context.

Learning design as “creative practice” (Maina et al., 2015, p.11), is a creative “activity-producing activity” (Engeström, 2015, p. 98) that can contribute to teachers' expansive learning.

Teachers can “give rise to something new" (Vygotsky, 2004, p. 7).

Teachers can learn "something that is not yet there" (Engeström & Sannino, 2010, p. 2).

Teachers can generate "new concepts and practices" (Sannino et al., 2016, p. 4) for technology-enhanced teaching and learning.

Learning design activity, an agentive activity conducive to the transformation of the teaching-learning activity

2nd point

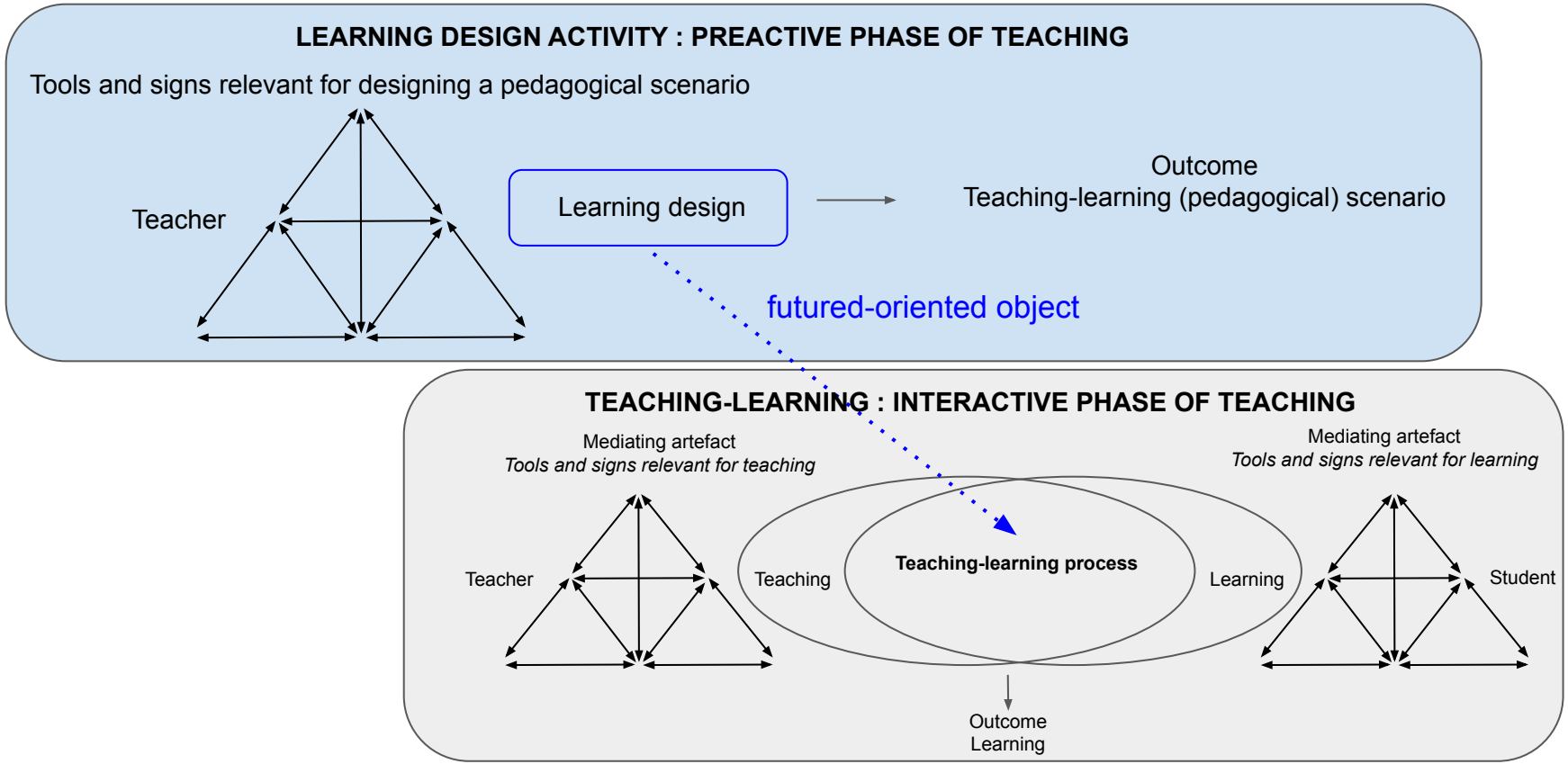


Figure 3. Learning design activity as a future-oriented activity

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

“Instructional planning is thinking about the future, doing something now for the future” (Musial & Tricot, 2020, p. 171).

Teachers as designers are placed between current reality and possible or even desired future.

Learning design is “change-oriented” (Maina et al, 2015, p.11).

Through learning design,

teachers can actualise their desire to transform teaching and learning;

teachers can take agentive actions by reconfiguring, reconceptualising (Engeström, 2011; Sannino et al., 2016) teaching and learning.

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

“Transformative agency carries a future orientation and involves decision making with both immediate and long-term consequences” (Brevik et al., 2019, p. 4).

Through learning design,

teachers project themselves into a future teaching-learning activity,

teachers make a succession of decisions (Wanlin, 2009)

with an immediate consequence : the new pedagogical scenario

and a longer-term consequence : the transformation of teaching-learning activity.

Through learning design,

teachers can take transformative agentive actions directed towards teaching and learning.

teachers can contribute "concretely to the change of some specific circumstances" (Sannino, 2015, p. 1) of the teaching-learning activity by combining in a new way a set of actions and interactions between the students and themselves and with the artefacts, including digital technologies.

teachers can take “intentional transformative actions inventing and using artifacts” - digital technologies among others - to control their actions from the outside (Engeström, 2011, p. 610).

The pedagogical scenario, an artefact that conditions the integration of digital technology into teaching and learning

3rd point

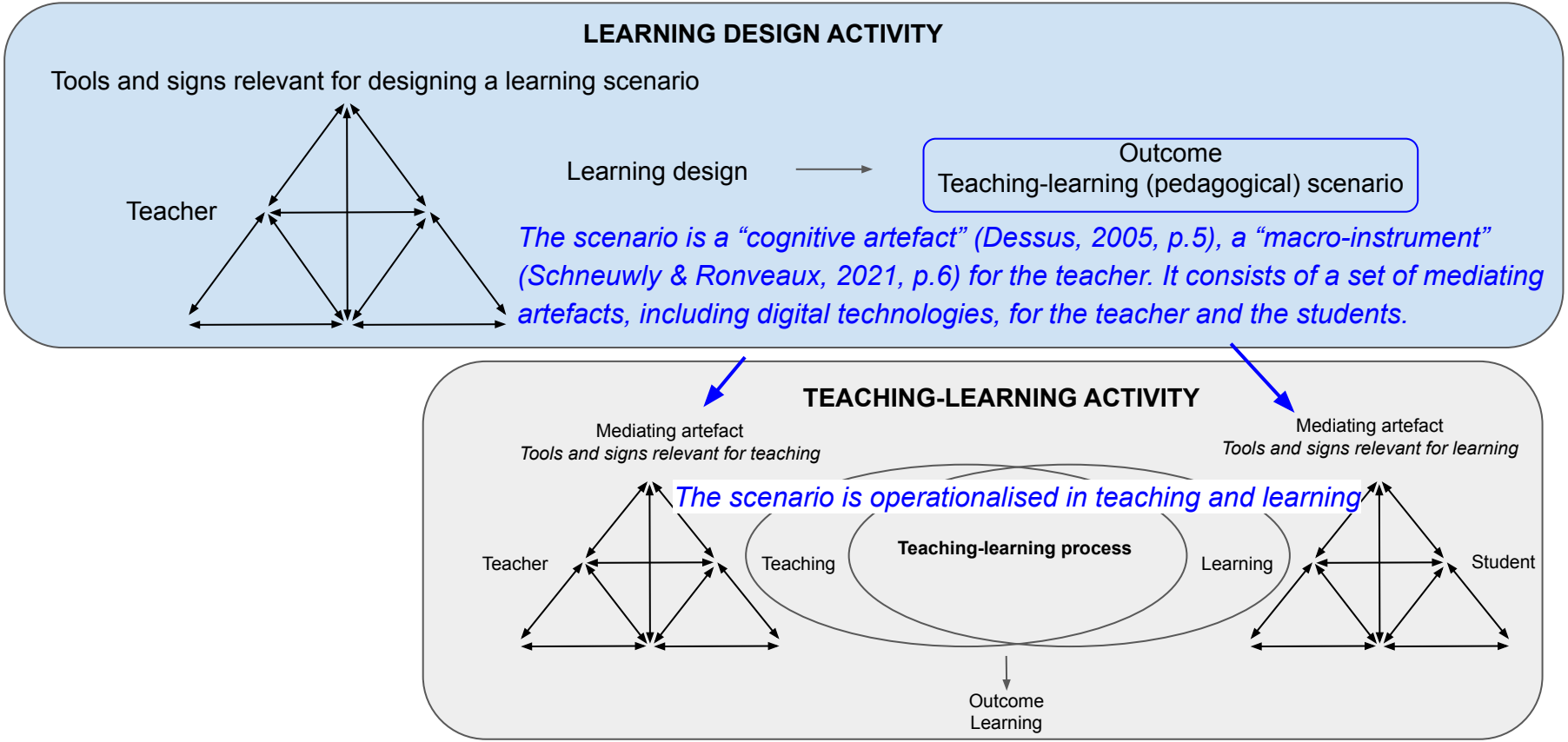


Figure 4. Pedagogical scenario as a set of mediating artefacts for the teacher and the students

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

The pedagogical scenario is pivotal for “the success of the didactic action in situ (i.e. in the classroom), i.e. the success in student learning and its support by the teacher” (Tricot & Musial, 2020, p.139).

The pedagogical scenario defines

- learning objectives, some of which may relate to digital literacy and citizenship,
- learning tasks,
- "the teaching-learning configuration" (Tricot & Musial, 2020, p. 135), i.e. teacher-student or student-student interactions,
- the pedagogical use of digital technologies in the teaching-learning process.

Through learning design, teachers make pedagogical and didactic decisions about the use of digital technologies
in relation to learning objectives and tasks
and in coherence with the different elements of the situation they are considering.

The outcome of this activity is the pedagogical scenario that is operationalised in technology-enhanced learning (TEL) activity.

Learning design of Technology-Enhanced Learning as a way to expanding a Zone of Proximal Development for teachers

4th point

Designing TEL scenarios can help expanding a Zone of Proximal Development (Vygotsky, 1980) towards teachers' Professional Digital Competence (PDC).

Dimensions of teachers' PDC

- subject digital competence "captures how school subjects are affected and afforded by digitalisation" (Brevik et al., 2019, p.3);

- didactic and pedagogical digital competence "captures what is specific to each subject when taught with and through ICT" and "includes various aspects related to and supporting teaching in technology-rich environments" (Gudmundsdottir & Hatlevik, 2018, p.217);

- "Profession-oriented competence" (Gudmundsdottir & Hatlevik, 2018, p.217) is "connected to teachers' professional enactment of PDC : how they design lessons, approach assessment,[...] conduct classroom management in technologically rich classrooms" (Brevik et al., 2019, p.3).

By designing TEL scenarios in training sessions, teachers can operationalise all the dimensions of PDC.

2 Learning design activity as a central activity system for the integration of digital technology into teaching and learning

From a CHAT perspective, when it comes to adopting a new element from the outside such as digital technologies, the old element “collides with the new one” (Engeström, 2011, p.609).

“Such contradictions generate disturbances and conflicts but also innovative attempts to change the activity” (Engeström, 2011, p.609).

Contradictions teachers face when designing TEL scenarios are a "source of change and development" (p. 609) and expand towards a Zone of Proximal Development (Vygotsky, 1980).

Re-mediation **of learning design activity of TEL scenarios into a formative intervention inspired by the Change Laboratory methodology**

Re-mediation → modification of the usual "mediational structure" (Engeström, 1994, p. 45) of learning design activity

Co-design of TEL scenarios within a team of teachers (Voogt et al., 2015, p.262) :
“The collaborative and socially-situated dimension in design work ‘requires and brings about collective and distributed agency’ (Engeström & Sannino 2010, p. 7)”

Card-based co-design of TEL scenarios
Characteristics of design activity :
“ill-definedness, complexity, ambiguity, the incomplete and especially the conflicting nature of its constraints” (Visser, 2006, p.142)

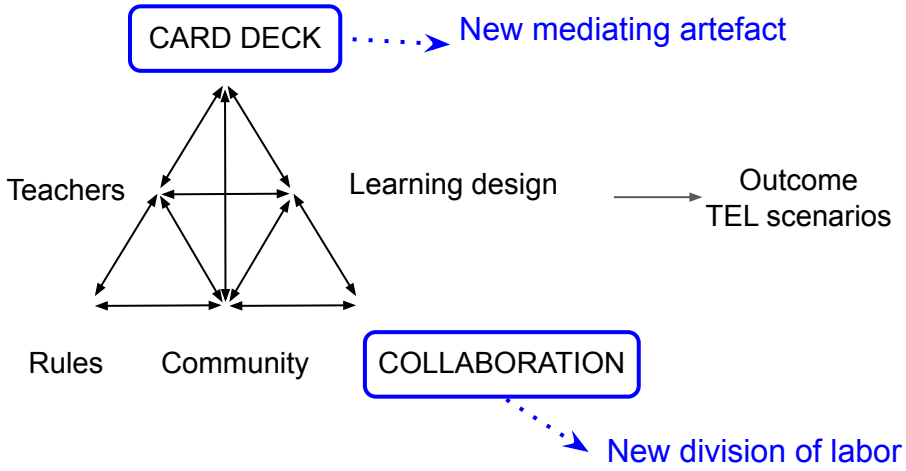


Figure 5. *Re-mediation* of learning design activity of TEL scenarios

Figure 6. Card-based co-design of TEL scenarios within a team of teachers (pilot study).

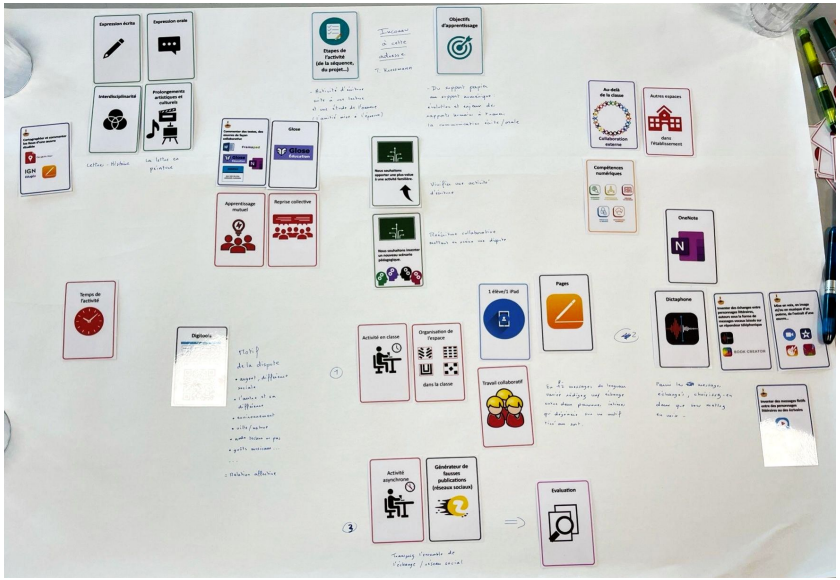


Figure 7. The card-based design tool : a TEL scenario designed during a card-based co-design session (pilot study).

3 A formative intervention based on Learning design activity of TEL scenarios.

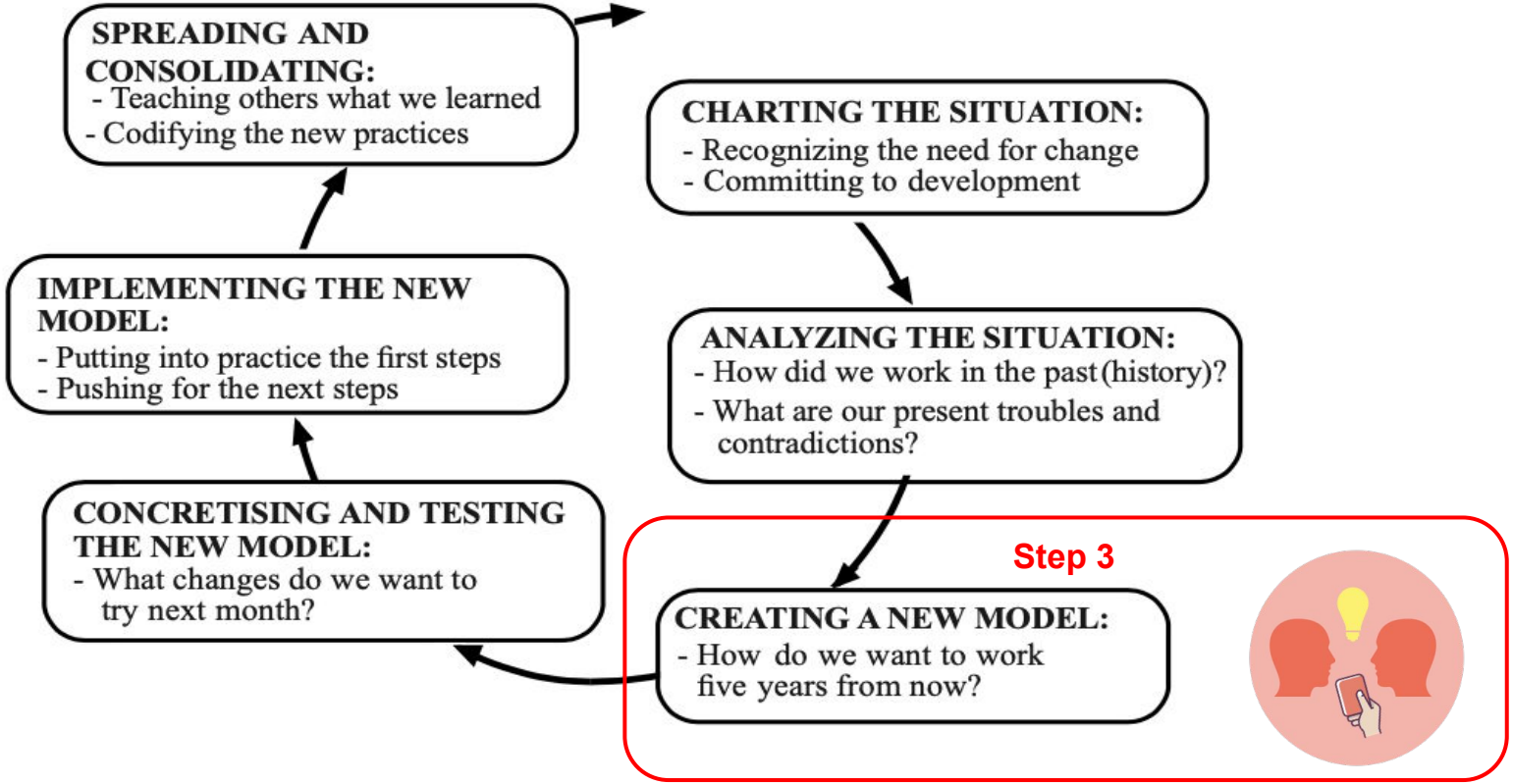


Figure 8. Co-design of TEL scenarios into the phases of a Change Laboratory process (Adapted from Virkkunen & Newnham, 2013, p. 17)

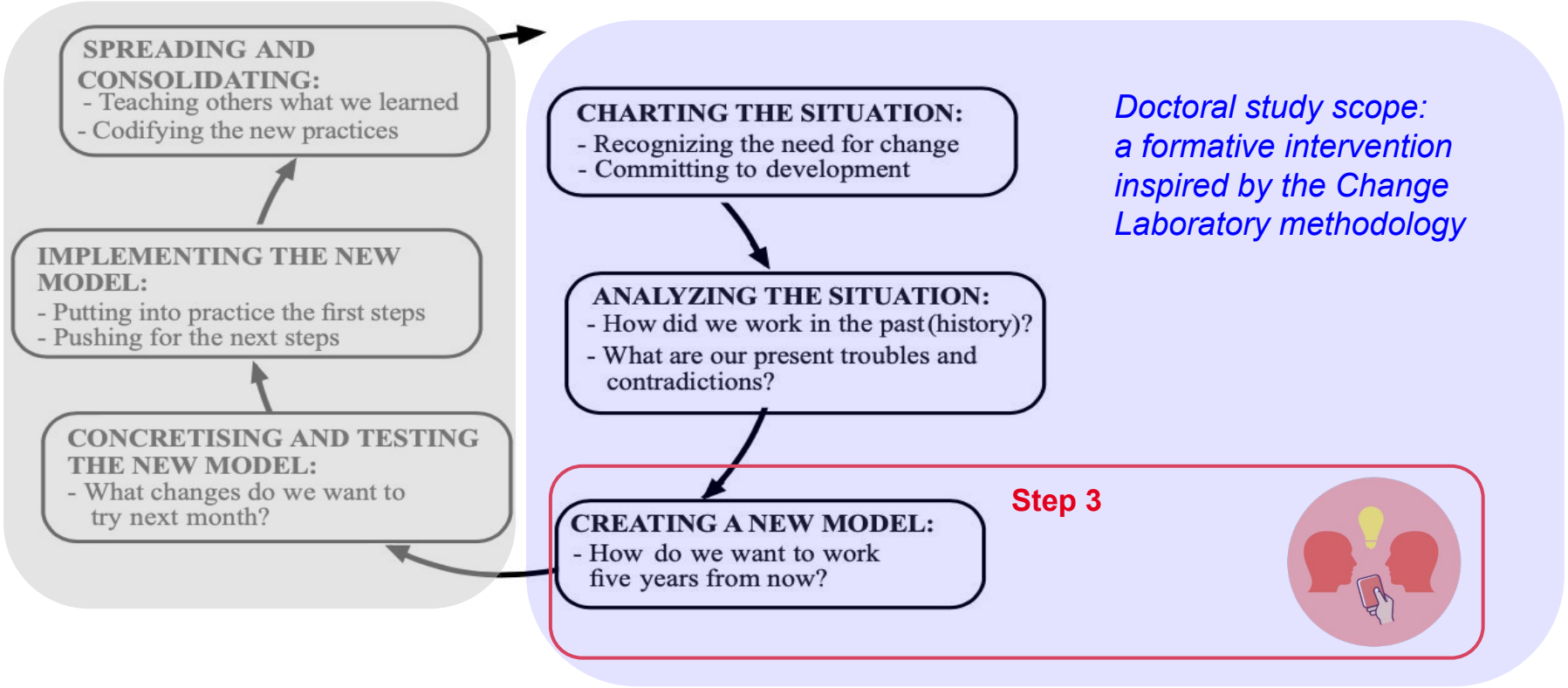


Figure 8. Co-design of TEL scenarios into the step 3 of a Change Laboratory-like process (Adapted from Virkkunen & Newnham, 2013, p. 17)

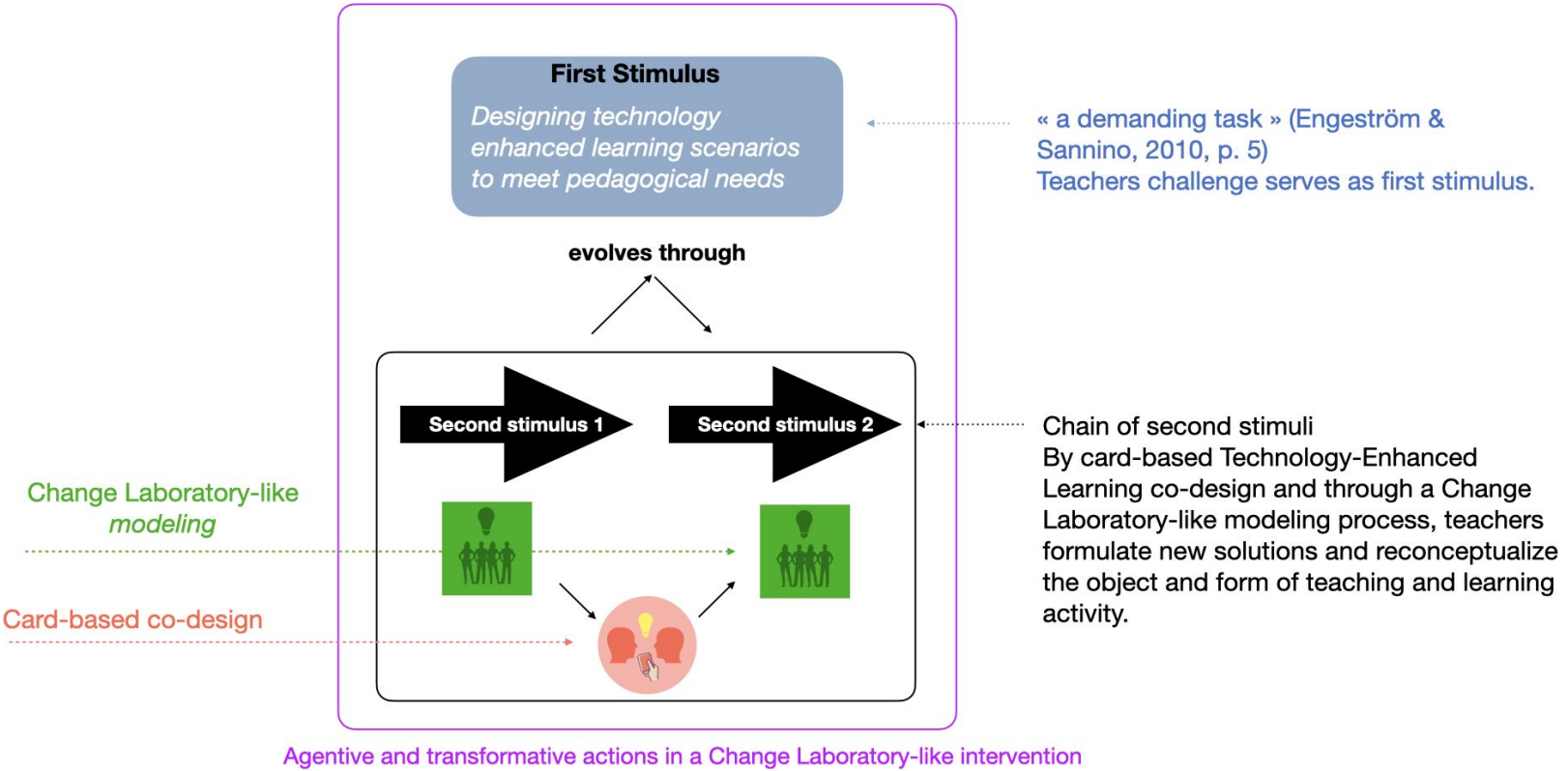


Figure 9. Transforming teaching and learning through card-based co-design of TEL scenarios into a Change Laboratory-like intervention

3 **A formative intervention based on Learning design activity of TEL scenarios.**

Four characteristics of learning design activity of TEL scenarios

- a creative activity;
- an agentive and transformative activity;
- pedagogical scenario conditions the integration of digital technology into teaching and learning;
- activity system that opens a Zone of Proximal Development (Vygotsky, 1980) towards teachers' Professional Digital Competence.

Card-based co-design of TEL scenarios into a Change laboratory-like intervention

to trigger transformative agency (Engeström et al., 2014; Engeström & Sannino, 2013; Haapasaari et al., 2016; Virkkunen, 2006) and expansive learning (Engeström, 2015; Engeström & Sannino, 2010) oriented towards **transformation and reconceptualisation** (Engeström, 2011; Sannino et al., 2016) **of teaching and learning *with* digital technologies.**

CONCLUSION

Thank you for your attention.

@cduret
@margaridaromero

References

Albion, P., & Tondeur, J. (2018). Information and Communication Technology and Education : Meaningful Change through Teacher Agency.

Bonnardel, N. (2009). Activités de conception et créativité : De l'analyse des facteurs cognitifs à l'assistance aux activités de conception créatives. Le travail humain, 72(1), 5. https://doi.org/10.3917/th.721.0005

Bonnardel, N., & Lubart, T. (2019). La créativité : Approches et méthodes en psychologie et en ergonomie. RIMHE : Revue Interdisciplinaire Management, Homme Entreprise, 378(4), 79‑98. https://www.cairn.info/revue-rimhe-2019-4-page-79.htm

Brevik, L., Guðmundsdóttir, G., Lund, A., & Strømme, T. (2019). Transformative agency in teacher education : Fostering professional digital competence. Teaching and Teacher Education, 86. https://doi.org/10.1016/j.tate.2019.07.005

Dessus, P. (2000). La planification de séquences d'enseignement, objet de description ou de prescription? Revue française de pédagogie, 133(1), 101‑116. https://doi.org/10.3406/rfp.2000.1024

Engeström, Y. (1994). Teachers as Collaborative Thinkers : Activity-Theoretical Study of an Innovative Teacher Team. In I. Carlgren, G. Handal, & S. Vaage (Éds.), Teachers' minds and actions (p. 43‑61). Falmer Press.

Engeström, Y. (2001). Expansive Learning at Work : Toward an activity theoretical reconceptualization. Journal of Education and Work, 14(1), 133‑156. https://doi.org/10.1080/13639080020028747

Engeström, Y. (2009). The Future of Activity Theory : A Rough Draft. In A. Sannino, H. Daniels, & K. D. Gutierrez (Éds.), Learning and Expanding with Activity Theory (p. 303‑328). Cambridge University Press. https://doi.org/10.1017/CBO9780511809989.020

Engeström, Y. (2011). From design experiments to formative interventions. Theory & Psychology, 21(5), 598-628. https://doi.org/10.1177/0959354311419252
Engeström, Y. (2015). Learning by expanding. Cambridge University Press.
Engeström, Y., & Glăveanu, V. (2012). On Third Generation Activity Theory : Interview With Yrjö Engeström. https://doi.org/10.23668/psycharchives.1361
Engeström, Y., Nuttall, J., & Hopwood, N. (2020). Transformative agency by double stimulation : Advances in theory and methodology. Pedagogy, Culture & Society, 0(0), 1-7. https://doi.org/10.1080/14681366.2020.1805499
Engeström, Y., Pihlaja, J., Helle, M., Virkkunen, J., & Poikela, R. (1996). The change laboratory as a tool for transforming work. Lifelong Learning in Europe, 1(2), 10-17. https://researchportal.helsinki.fi/en/publications/the-change-laboratory-as-a-tool-for-transforming-work
Engeström, Y., & Sannino, A. (2010). Studies of expansive learning : Foundations, findings and future challenges. Educational Research Review, 5(1), 1-24. https://doi.org/10.1016/j.edurev.2009.12.002
Engeström, Y., & Sannino, A. (2013). La volition et l'agentivité transformatrice : Perspective théorique de l'activité. Revue internationale du CRIRES : innover dans la tradition de Vygotsky, 1(1), 4-19. //ojs.crires.ulaval.ca/index.php/ric/article/view/7
Engeström, Y., & Sannino, A. (2021). From mediated actions to heterogenous coalitions : Four generations of activity-theoretical studies of work and learning. Mind, Culture, and Activity, 28(1), 4-23. https://doi.org/10.1080/10749039.2020.1806328
Engeström, Y., Sannino, A., & Virkkunen, J. (2014). On the Methodological Demands of Formative Interventions. Mind, Culture, and Activity, 21(2), 118-128. https://doi.org/10.1080/10749039.2014.891868
Fiévez, A. (2017). L'intégration des TIC en contexte éducatif : Modèles, réalités et enjeux. PUQ.

Giraudon, G., Guitton, P., Romero, M., Roy, D., & Viéville, T. (2020). Éducation et numérique. Défis et enjeux (Livre blanc No 4; Inria). Inria. https://www.inria.fr/sites/default/files/2020-12/Livre%20Blanc%20Inria%20%C3%A9ducation%20et%20num%C3%A9rique.pdf
Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence : Implications for teacher education. European Journal of Teacher Education, 41(2), 214-231. https://doi.org/10.1080/02619768.2017.1416085
Haapasaari, A., Engeström, Y., & Kerosuo, H. (2016). The emergence of learners' transformative agency in a Change Laboratory intervention. Journal of Education and Work, 29(2), 232-262. https://doi.org/10.1080/13639080.2014.900168
Juutilainen, M., Metsäpelto, R.-L., & Poikkeus, A.-M. (2018). Becoming agentic teachers : Experiences of the home group approach as a resource for supporting teacher students' agency. Teaching and Teacher Education, 76, 116-125. https://doi.org/10.1016/j.tate.2018.08.013
Koehler, M. J., & Mishra, P. (2005). Teachers Learning Technology by Design. 9.
Kumpulainen, K., Kajamaa, A., & Rajala, A. (2018). Understanding educational change : Agency-structure dynamics in a novel design and making environment. Digital Education Review, 26-38. https://doi.org/10.1344/der.2018.33.26-38
Lund, A., & Eriksen, T. M. (2016). Teacher Education as Transformation : Some Lessons Learned from a Center for Excellence in Education. Acta Didactica Norge, 10(2), 53-72. https://doi.org/10.5617/adno.2483
Lund, A., Furberg, A., Bakken, J., & Engelien, K. L. (2014). Nordic Journal of Digital Literacy, 9(04), 280-298. https://doi.org/10.18261/ISSN1891-943X-2014-04-04
Maina, M., Craft, B., & Mor, Y. (Éds.). (2015). The art & science of learning design. Sense Publishers.
Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge : A framework for teacher knowledge. Teachers college record, 108(6), 1017.

Morselli, D., & Sannino, A. (2021). Testing the model of double stimulation in a Change Laboratory. Teaching and Teacher Education, 97, 103224. https://doi.org/10.1016/j.tate.2020.103224
Priestley, M., Edwards, R., Priestley, A., & Miller, K. (2012). Teacher Agency in Curriculum Making : Agents of Change and Spaces for Manoeuvre. Curriculum Inquiry, 42(2), 191‑214. https://doi.org/10.1111/j.1467-873X.2012.00588.x
Romero, M., Ouellet, H., & Sawchuk, K. (2017). Expanding the Game Design Play and Experience Framework for Game-Based Lifelong Learning (GD-LLL-PE). In M. Romero, K. Sawchuk, J. Blat, S. Sayago, & H. Ouellet (Éds.), Game-based learning across the lifespan : Cross-generational and age-oriented topics (p. 1‑11). Springer.
Sannino, A. (2013). Critical Transitions in the Pursuit of a Professional Object : Simone de Beauvoir's Expansive Journey to Become a Writer. In Learning and Collective Creativity. Routledge.
Sannino, A. (2015). The principle of double stimulation : A path to volitional action. Learning, Culture and Social Interaction, 6, 1‑15. https://doi.org/10.1016/j.lcsi.2015.01.001
Sannino, A., Daniels, H., & Gutiérrez, K. D. (2009). Activity Theory Between Historical Engagement and Future-Making Practice. In A. Sannino, H. Daniels, & K. D. Gutierrez (Éds.), Learning and Expanding with Activity Theory (p. 1‑16). Cambridge University Press. https://doi.org/10.1017/CBO9780511809989.002
Sannino, A., & Engeström, Y. (2018). Cultural-historical activity theory : Founding insights and new challenges. Cultural-Historical Psychology, 14(3), 43‑56. https://doi.org/10.17759/chp.2018140304
Sannino, A., Engeström, Y., & Lemos, M. (2016). Formative Interventions for Expansive Learning and Transformative Agency. https://helda.helsinki.fi/handle/10138/178032
Schneuwly, B., & Ronveaux, C. (2021). Une approche instrumentale de la transposition didactique. Pratiques. Linguistique, littérature, didactique, 189‑190, Article 189‑190. https://doi.org/10.4000/pratiques.9515

Stockless, A., & Villeneuve, S. (2017). Les compétences numériques chez les enseignants : Doit-on devenir un expert? In Usages créatifs du numérique pour l'apprentissage au XXIe siècle.
Stockless, A., Villeneuve, S., & Gingras, B. (2018). Maitrise d'outils technologiques : Son influence sur la compétence TIC des enseignants et les usages pédagogiques | Mastery of Digital Tools: The Influence on Information and Communication Technologies Competency and Pedagogical Use. 44. https://doi.org/10.21432/cjlt27581
Tao, J., & Gao, X. (2017). Teacher agency and identity commitment in curricular reform. Teaching and Teacher Education, 63, 346-355. https://doi.org/10.1016/j.tate.2017.01.010
Toom, A., Pyhältö, K., & Rust, F. O. (2015). Teachers' professional agency in contradictory times. Teachers and Teaching, 21(6), 615-623. https://doi.org/10.1080/13540602.2015.1044334
Tricot, A., & Musial, M. (2020). Précis d'ingénierie pédagogique. De Boeck Superieur.
Turkle, S., & Papert, S. (1992). Epistemological pluralism and the revaluation of the concrete. Journal of Mathematical Behavior, 11(1), 3-33.
van der Heijden, H. R. M. A., Geldens, J. J. M., Beijaard, D., & Popeijus, H. L. (2015). Characteristics of teachers as change agents. Teachers and Teaching, 21(6), 681-699. https://doi.org/10.1080/13540602.2015.1044328
Virkkunen, J. (2006). Dilemmes dans la construction d'une capacité d'action partagée de transformation. Activités, 03(3-1), Article 1. https://doi.org/10.4000/activites.1842
Virkkunen, J., & Newnham, D. S. (2013). A Change Laboratory in the Central Surgical Unit of Oulu University Hospital. In J. Virkkunen & D. S. Newnham (Éds.), The Change Laboratory : A Tool for Collaborative Development of Work and Education (p. 165-185). SensePublishers. https://doi.org/10.1007/978-94-6209-326-3_7

Visser, W. (2006). Designing as Construction of Representations : A Dynamic Viewpoint in Cognitive Design Research. Human–Computer Interaction, 21(1), 103-152. https://doi.org/10.1207/s15327051hci2101_4
Voogt, J., Laferriere, T., Breuleux, A., Itow, R., Hickey, D., & Mckenney, S. (2015). Collaborative design as a form of professional development. Instructional Science, 43. https://doi.org/10.1007/s11251-014-9340-7
Vygotsky, L. S. (1980). Mind in Society : The Development of Higher Psychological Processes. Harvard University Press.
Vygotsky, L. S. (1997). The Collected Works of L. S. Vygotsky : Problems of the Theory and History of Psychology. Springer Science & Business Media.
Vygotsky, L. S. (2004). Imagination and Creativity in Childhood. Journal of Russian & East European Psychology, 42(1), 7-97. https://doi.org/10.1080/10610405.2004.11059210
Wanlin, P. (2009). La pensée des enseignants lors de la planification de leur enseignement. Revue française de pédagogie, 89-128. https://doi.org/10.2307/41202607
Yamazumi, K. (2013). Beyond Traditional School Learning : Fostering Agency and Collective Creativity in Hybrid Educational Activities. In Learning and Collective Creativity. Routledge.