Galperin's Legacy and Some Current Challenges of Educational Research and Practice: Agency, Technology, and Design

Andreas Lund[a] & Irina Engeness[b]

Authors' affiliation:
[a] Department of Teacher Education and School Research, Faculty of Educational Sciences, University of Oslo
[b] Faculty of Education, Østfold University College

Full postal address:

Andreas Lund – Corresponding Author
Department of Teacher Education and School Research, Faculty of Educational Sciences
University of Oslo
P.O. Box 1099 Blindern
0317 Oslo, Norway
E-mail: andreas.lund@ils.uio.no
Phone: +47 91304004

Irina Engeness
Østfold University College
B R A veien 4
1757 NO-Halden
Norway
E-mail: irina.engeness@hiof.no
Phone: +47 48078749

Galperin's Legacy and Some Current Challenges of Educational Research and Practice: Agency, Technology, and Design

1. Introduction

At the risk of being overly selective and superficial, we argue that Galperin's legacy might offer a valuable contribution to some current and future-oriented themes in educational research and practice. Our intention is not to "map" Galperin's framework onto a particular problem space or phenomenon but rather to indicate how his approach might inspire, inform, and provide explanatory power to examine the process of learning and how knowledge is constructed and advanced. As Dafermos (2016) has shown with regard to translations and the use of the Vygotskian legacy in international academia, there is a risk of overlooking important cultural-historical contextual factors in Galperin's work and over extrapolating current issues of educational research and practice onto his framework. With this in mind, we briefly discuss some aspects of Galperin's legacy presented in the translated lectures in this special issue in relation to three current and future-oriented issues in education: i) agency and transformative agency, ii) digital artefacts as material and materialised resources, and iii) teaching as design.

2. Agency, transformative agency, and orientation

Agency and learning are intrinsically linked (Biesta & Tedder, 2007; Edwards, 2017) and mutually constitutive of the process of students' development as learners. The understanding and enactment of "human development as an active project of becoming" requires a transformative activist stance (Stetsenko, 2017, p. 210). Therefore, learning that leads to the development of the participants who engage in it cannot happen in passivity or as osmosis. In recent years, educational research has increasingly come to focus on the importance of agency in learning and as contributing to students' development as learners (for an overview, see, e.g., Etelepälto, Vähäsantanen, Hökkä, & Paloniemi, 2013). For example, the journal *Learning, Culture and Social Interaction* (Volume 10, 2016) devoted a special issue to this theme. Agency was understood here as "the capacity of humans to distance themselves from their *immediate* surroundings and it implies recognition of the possibility to intervene in, and transform the meaning of, situated activities" (Mäkitalo, 2016, p. 64, emphasis in original). The study and understanding of such intervention and transformation has recently drawn on (mostly fragmented and little systematised)

principles elicited from the works of Vygotsky, particularly his principle of double stimulation and learning in the zone of proximal development (ZPD). We are aware that the term *stimulation* might invoke notions of behaviourism and that Vygotsky did not use it. However, it seems to have become established in the neo-Vygotskian research literature (see also Lund & Vestøl, in press, for an extended discussion). This principle entails a first stimulus as a problem, dilemma, impasse, or challenging situation—all representations of a conflict of motives—and a second stimulus (or rather, series of stimuli) found in contextual and cultural resources that the agents exploit, transform, and instil with the power to transform the first stimulus (i.e., volitional and transformative agency; (Lund & Rasmussen, 2008; Sannino, 2014; Thorne, 2015). Students' learning in the ZPD adequately constructed by the teacher may stimulate their increasing ability to become aware of the process of learning and how to go about it (Edwards, 2017; Wertsch, 1991). Therefore, students' agency as learners may be enhanced.

In the introductory article in this special issue, we explicitly elaborated on the continuity of the Vygotsky–Galperin line of research and showed how Galperin extended and operationalised Vygotsky's contribution to educational research and practice. In Galperin's theory, the agency of the learner engaged in the learning activity is inherently connected with i) the orienting part of the learning activity (i.e., how agents become increasingly aware of uncertain and fluid meanings in diverse contexts) and ii) the transformation process of the forms of the activity that learners engage in, including the learner's external, social, and internal individual activities. In the process of such transformation, the learner encounters problems or situations characterised by fluidity, changing conditions, alternative responses, and other challenges that require more than mere automatic responses (Arievitch, 2017). As summarised by Arievitch and Haenen (2005), "an individual can foresee the effects of one's own actions, change the actions to fit the distinctive features of the situation, and anticipate options on the basis of previous experiences" (p. 161).

In the translated lectures, Galperin conceptualised learning as an orienting activity of the participants engaged in this activity. Such an activity involves two main components: different kinds of images and the participants' actions in terms of these images:

> So, we have two main components of any orienting activity - these are images that represent the reality around us (images as such, with their potential, as a plan or as a real ongoing process), and then, the actions that we perform in terms of these images which are ideal

too. Therefore, our task today is narrowed to the two main elements of orientation: images and ideal actions in terms of images. (Galperin, 2002, Lecture 10, p. 3)

Conceptualising learning as an orienting activity has implications for our understanding of a structural unit of an action that includes both images with their potential and actions performed with these images. In Lecture 10, Galperin termed such a structural unit as the *orienting basis of an action*. He elaborated that the orienting basis of an action presents a system of necessary conditions to support and facilitate students' engagement in learning. Therefore, the orienting basis of an action inevitably contributes to and affects the development of the learner's transformative and enacted agency.

A specific and especially important element of the orienting basis of an action is *an operational scheme of thinking*, which presents an action as a whole and contributes to the development of the learner's so-called "meta-understanding of an action" (Galperin, 2002, Lecture 10, p. 14). In Lecture 10, Galperin discussed the range of individual steps of an operational scheme of thinking, an operationalisation of Vygotsky's notion of the zone of proximal development (ZPD). In doing so, Galperin placed the learner's transformative agency within the learner's ZPD. In addition, he unpacked and operationalised the transformation of the learner's agency in the ZPD beyond Vygotsky's general conceptualisation:

> A learner starts with the steps he can do himself and then the steps should increase, although the general structure of the action remains the same. After a while, the learner is able to proceed in bigger steps, which is one of the most important tasks - to increase the size of the steps of the action while it is being performed. In the end, the action turns into one continuous stream, into one single step. (Galperin, 2002, Lecture 10, p. 15)

In Lecture 10, Galperin explained the link between the operational scheme of thinking and the learner's agency:

> If a learner has all the necessary prerequisites and if you have created the complete scheme, then the indicator of this is a paradoxical situation that, following the outline of this scheme, a student who has been unable to perform the action without the scheme, can perform it correctly from the first attempt and repeat this performance correctly every time afterwards. (Galperin, 2002, Lecture 10, p. 17)

Galperin emphasised the significance of the operational scheme created by the teacher to enhance the learner's agency. In this respect, the operational scheme of thinking is employed as a mediational tool that supports learning and therefore enhances the learner's agency. The operational scheme of thinking presents an action as a whole—a mediational tool to encourage abstract thinking among learners without resorting to physical action.

In the introductory article, we elaborated on the three types of orientation that might facilitate students' learning (Engeness & Lund, this issue; Lecture 13). We argued that the third type of orientation—complete and constructed by learners following an approach offered by the teacher—might facilitate both conceptual learning and students' understanding of how learning works and how to go about learning within and across subject areas. The third type of orientation might therefore have direct implications for the development and transformation of the agency of both students and teachers engaged in the learning process.

Galperin's framework conceptualises the learner's transformative agency, which develops and undergoes changes in the course of different forms of activity that learners engage in. Such a transformation follows a pathway from the external and social plane to the internal and individual plane of the learner. During this transformation, each previous form of a learning activity is dialectically linked with and gives rise to a subsequent new form of activity. In doing so, the potential dichotomy between external and internal (mental) activity is suspended by such transformative agency (Arievitch, 2003).

In the lectures (Lecture 12 in particular), Galperin outlined a structure for the development and enactment of learners' transformative agency through six consecutive phases:

1. The initial phase is motivation, where the student's attitude towards the learning activity is formed. This phase has a direct bearing on the third phase, in which the student engages in the external activity with material or materialised artefacts that are vital to performing actions: "Motivation is an orienting aspect, a guiding aspect, identifying in the object of the action and in the action itself what is important for the learner" (Galperin, 2002, Lecture 10, p. 11).

2. In the second phase, orientation, the student looks ahead to grasp the wholeness of the task and identify the conditions necessary to carry out the action (including what may be missing in order to perform the necessary action). Galperin identified three main types of orientation, which he discussed at the beginning of Lecture 13 (for details, see Engeness & Lund, this issue).

3. In the phase of a material or materialised action, the student uses artefacts or his or her representations to cope with a task: "A material object can be substituted by a materialised object, which is a transformed form of a material one. You can either use material models or you can use diagrams, representations and even notes" (Galperin, 2002, Lecture 13, p. 3). The learner's initial engagement with the material or materialised resources through speech and collective interaction is gradually transformed into ideal or mental action. According to Galperin (2002, Lecture 13, p. 4), material or materialised action is the most important phase:

> The materialised form of action is one of the most important; it is in fact the most important of all the forms, because in this form you can show the full composition of an action, and teach how to transfer the initial material into the desired outcome. This form of action can also be used when we need to re-teach someone if, for example, a person has developed an action that does not match the requirements of the task.

We will return to this observation in the section on digital technologies.

4. Communicated thinking is an intermediate phase between material collaborative and individual action. Language is the primary mediating tool transforming material action into articulated action when the learners construct meaning and gradually become aware of the potential of the material or materialised objects they interact with. At the same time, communicated thinking externalises the action, making it visible and observable from the outside. It also serves to control or monitor the action, since it is audible and therefore accessible to both learners and teachers. The link to Vygotsky's (1986) *Thought and Language* is quite recognisable; the book's title refers to activities rather than entities and the relationship between intellectual and verbal processes; thought is not merely expressed in but generated and completed through language.

5. In the phase of silent speech (in our terms, dialogical thinking), the action is further transferred to the individual plane and transformed into cognition. In this phase, the learner performs an action by engaging in a dialogue with himself or herself and operating with meanings and the ideal images of the material objects he or she engaged with previously. At this point, external control or monitoring slips away, since mind reading does not occur. However, the results of this semi-mental action can be articulated.

6. The final phase is acting mentally, where the action is performed in the mind as a "pure thought" (Galperin, 2002, Lecture 13, p. 8). The learner is able to perform the action with the ideal

images and meanings of the material or materialised objects. The action is performed smoothly as one continuous movement.

These phases or forms of learning activity explicitly show how the learner's agency develops and is transformed in the learning process; in doing so, the phases offer an approach to conceptualising the notion of transformative agency.

A number of considerations apply to the phases outlined above. First, as Podolskij emphasised repeatedly in his contribution to this special issue and in earlier research (2008, 2009), the phases do not add up to an algorithm or any form of sequential determinism or prescriptive blueprint for teaching. Galperin's systematic approach was never fully developed, changed frequently, and should be viewed as a malleable, holistic, and general model of how mental activity emerges from the transformation of mediated external activity at the material level via the verbal level and towards acting mentally. Such an approach offers a theoretical and methodological development of Vygotsky's (and Leontiev's) contributions. Galperin's attempt to analytically disassemble the process of learning into a seemingly stepwise approach serves to unpack the complexity and the black box of the learning process, which becomes easily accessible to learners and can therefore be actively constructed by students and teachers. However, such detailed clarification risks being automatically transferred to a prescriptive didactic framework for teaching instead of serving as a point of departure for creative designs for teaching and learning (Podolskiy, 2014; Rambusch, 2006).

Second, while Galperin's approach to agency takes the individual's mental action as the main purpose of the learning activity, we see no reason why his framework cannot be extended to embrace the notion of collaborative mental activities. Galperin (2002) rarely addressed the collective level directly, but in Lecture 11, he was quite explicit: "The important thing is that the operational scheme of thinking is always present, even in the smallest activities either collective or individual" (p.9). Applying collaborative perspectives could be an exciting extension of Galperin's legacy and research on Galperin's contributions, and it would certainly resonate with his ambitious goal of merging individual and collective perspectives: "It is Galperin's understanding of *mental processes in a nonmentalist* way, and of *individuals in a nonindividualistic* way - without throwing individual cognition away all together" (Arievitch, 2003, p. 283, emphasis in original).

Third, the sequential linearity of the phases outlined above can be questioned in modern classrooms and therefore begs further research (Engeness, 2018).

Galperin's contribution to understanding agency can best be summarised in his own words: "*The third subsystem* transfers the original external action with objects to the ideal plane of the subject and transforms this action into a new psychological process" (Lecture 10, p. 8, emphasis in original). While recent scholarly interest in agency has brought about important insights in relational agency (Edwards, 2011; Sannino & Engeström, 2017) and transformative agency (Haapasaari, Engeström, & Kerosuo, 2014; Kerosuo, 2017; Sannino, Engeström, & Lemos, 2016; Stetsenko, 2017), Galperin takes us beyond the relational and situated aspects of agency and examines how transformative agency is intrinsically linked to the learning and development of learners. Learning for Galperin does not happen for the sake of accumulating new knowledge. Rather, learning involves developing a growing understanding of how to approach learning and transform the learners' agentic capacity to enhance their control over their own learning. From this perspective, learning carries a future-oriented dimension beyond the merely situated experience (Engeness & Lund, this issue). A particular role in the development and transformation of learners' agentic capacity is played by material or materialised mediating resources. Digital artefacts (i.e., hardware, applications, archives, and networks) constitute one example of such resources.

3. Digital artefacts as material and materialised resources

The mediating role of cultural resources or artefacts for developing cognition and advancing knowledge is a distinguishing feature of sociocultural and cultural-historical approaches to learning. With the advent, impact, and rapid refinement of digital technologies, the mediating processes have been further examined and the relationship between human agency and material-technological affordances has attracted quite some interest among researchers (see, e.g., Burbules & Callister, 2000; Koschmann, 1996; Shaffer & Clinton, 2006, for diverse but comprehensive approaches). However, few studies have operated with a principled view of digital technologies in light of sociocultural and cultural-historical conceptual frameworks (for exceptions, see, e.g., Kaptelinin & Nardi, 2006; Säljö, 1999).

In the lectures presented in this special issue, Galperin mentioned the computer only once. In Lecture 10, he stated, "So, contrary to what is required from the computer, we, from the very beginning, rely on the learner's understanding of the part or a step of the action that is being

performed" (p. 16). However, he referred to the "machine" on 13 occasions (Lectures 10 and 11) in similar terms. His observations are, of course, coloured by a contemporary view of computers as machines that blindly perform certain procedures without any conception of agency or understanding of what kind of learning these machines facilitate.

However, in Galperin's principles of material and materialised action, we find an intriguing approach to creating connections between cultural mediating resources and mental activity. Such an approach has relevance for the more recent development of pedagogical practices involving digital resources. Galperin expounded on the general principle of mediating artefacts by focusing on how a cultural tool (material or materialised in the form of representations) can "perform an action or create additional conditions for the action" (Lecture 10, p. 2; see also p. 9). Galperin also firmly placed such tools at the heart of both orienting and executive parts of an action, exercising orienting as well as facilitating functions (Lecture 11, p. 3). As he summarised in Lecture 12 (p. 6), "In our approach, we provide a learner with a reliable tool - the scheme of the orienting basis of the action and different groups or types of materials" (for an elaboration of "material", see Lecture 11, pp. 3 and 11, and Lecture 12, pp. 3–4). An adequately structured scheme for the orienting basis of an action creates a learning situation where the learner does not have to approach the tasks gradually from simple to complex but holistically while developing his/her understanding of the learning activity as a whole. By applying such an approach, different tasks may be presented to learners using "the principle of contrast, psychological surprise to keep the learner in a state of high intellectual liveliness, intellectually alert" (Lecture 12, p.6). This approach might also be understood as a condition for the development of artefact-mediated transformative agency, since "the same tool performs completely opposite functions" (Lecture 13, p. 5) and thus calls for active decision making between possible alternatives.

In digital environments or learning activities, a material object can "be substituted by a materialised object, which is a transformed form of a material one. You can either use material models or you can use diagrams, representations and even notes" (Lecture 13, p.3). Galperin added, "We label it a materialised action because materialisation of knowledge you learned previously occurs" (Lecture 13, p. 3). Here, Galperin articulated a view of materialisation that comes close to Wartofsky's (1979) notion of secondary artefacts, which represent the primary artefact (be it material or conceptual) in the form of guidelines, manuals, scripts for action, and the like. Therefore, the material or primary artefact (or object in Galperin's terms) is assigned specific

properties or affordances. Galperin placed great emphasis on this "because in this form you can show the full composition of an action, and teach how to transfer the initial material into the desired outcome" (Lecture 12, p. 4).

This is a stimulating point of departure for studying and exploiting the relationship between humans and digital technologies. Digital resources come with certain affordances. They are materialisations of knowledge developed collectively over generations; they connect minds, hands, and emotions; they make it possible to construct and dismantle virtual communicative spaces; they afford multimodal representations of knowledge; and they transform or even offer new ways of going about certain institutionalised procedures—for example, going from handwriting to word processing involves a shift in how we think about written communication and its epistemology (Heim, 1987). In addition, digitised information means nearly unlimited accessibility and potentially copying and manipulating information, thus requiring new types of student tasks and assignments that, to a greater extent, require performative competence (Säljö, 2010) and not just documenting end results—an epistemological shift. Also, as digital technologies become more sophisticated and powerful, they come with inscriptions, lend themselves to certain practices, or even exercise agency to the extent that they are perceived as, for instance, *actants* or represent alternative life worlds for humans to act out additional identities (Latour, 1999; Shaffer & Clinton, 2006).

Hence, we argue that revisiting the human–digital artefact dimensions from a Galperian perspective can further enhance our understanding of conceptual frameworks and approaches to the design of digital learning environments aimed at enhancing the learning and development of students as learners: "On the external plane, when a person moves from action with material objects to communicative action, a transformation from the action with objects to thinking about this action occurs" (Galperin, 2002, Lecture 13, p. 7). Galperin further emphasised this dimension: "Control can only be achieved when an object and an action with this object is performed on the external plane. Then you can control your learning! Therefore, the materialised form of the action is the most important form for learning and teaching" (Lecture 13, p. 4). We see that Galperin operates with a dialectic relationship between the transformative agency of students and teachers all engaged in the process of learning. The transformative and controlling forces are both essential for the conditions of internalisation. Digital resources afford such dialectics as they potentially open up new horizons for learning and teaching and at the same time allow multimodal

representations of the learning object to be constructed. The intersecting themes of transformation and digital resources are also the subject of discussion in Rückriem's (2009) challenge to cultural-historical activity theory (CHAT). Rückriem (2009, p. 95) claimed that digital resources fundamentally change the conditions for human activity, serving as "a basic transformation factor"; however, this transformative perspective has not been sufficiently acknowledged by CHAT. By connecting Galperin's transformative framework of learning and development to the transformative potential of digital resources, we see the embryo of a truly professional digital competence for educators (Lund, Furberg, Bakken, & Engelien, 2014).

We have already begun to indicate that Galperin's contribution may also have implications for the design of digital resources, learning activities, and learning environments that enhance learners' agentic capacity to learn. One of the practical implications may be the design of digital tools to support the third type of orientation (Engeness & Lund, this issue) aimed not only at assisting students in completing a specific task, but also at facilitating the development of learners' understanding of approaches that reveal the nature of learning (Engeness, 2018).

To summarise, we assert that Galperin's framework, and especially his view of the transformative nature of the human mind, can offer a cultural-historical-inspired approach to the design of digital technologies and educational practices that do not end in reductionism, instrumentalism, and mere add-ons to existing practices. Arievitch (2017) argued that traditional education "fails to provide children with the necessary tools and conditions for adequate orientation in the task" (p. 122). Rather, the dialectic constituents of learners' agency and appropriately designed digital artefacts can unleash educational practices with genuine validity for the 21st century that have a firm basis in the cultural-historical perspective. However, how such potential can materialise in educational settings needs careful co-designs and extensive collaborative efforts of professional teachers, students, and researchers.

4. Teaching as design

Reading the four lectures, we are struck by the teacher being assigned a role as an interventionist, which is different from being an uncontested authority, as in traditional education. Such a role involves intervening in and facilitating the transformative process of learning from the material to the cognitive individual action of the student. Particular attention is given to the teacher's role as a designer of the learning process or, in Galperin's terms, the *orienting scheme of*

action as the point of departure for the student's orienting endeavour: to understand the task, exercise agency, and use relevant available resources to respond to the task. When we juxtapose the learner's agency with digital technologies, as material as well as materialised action, we may infer several educational (pedagogic and didactic) implications that add up to the notion of *designs* and teaching as a *design praxis* (i.e., where theory and practice form a dialectic unit; Roth & Lee, 2007). In recent years, scholarly interest in teaching as the design of learning resources, environments, and activities has produced a rich and diverse literature. In this literature, digital resources are often at the fore, while the notion of design is sometimes linked to an art form and improvisation, sometimes to scientific and even rather prescriptive approaches, and often somewhere in between (see, e.g., Agostinho, Bennett, Lockyer, & Harper, 2011; Bower, 2017; Conole, 2008; Goodyear, 2015; Kaptelinin & Nardi, 2006; Laurillard, 2012; Luckin, 2010; Lund & Hauge, 2011; Maina, Craft, & Mor, 2015; Vestøl & Lund, 2017).

In his lectures, Galperin wove a pattern of how agency, artefacts, and mental development add up to a *design praxis* with high relevance for teachers. The term "design" was used repeatedly in Lecture 10, pp. 7–8, where Galperin discussed the necessity of designing for action; merely observing how learning unfolds does not tell us anything about the process but only the result. Thus, design is linked to an interventionist approach, which aims to examine the process of learning instead of merely observing it.

Galperin invoked the concept of an orienting scheme of action, specifying it as "a plan of actions, a scheme of the future" (Lecture 10, p. 1), followed by the identification of four components later explained in more detail (Lecture 10, pp. 10 and 15). A scheme is a cultural tool or a design that can be used to propose, anticipate, and enact knowledge work: "We call it a scheme because the action has not happened yet and when the action happens, then the scheme will turn into the orienting basis of the action" (Lecture 10, p. 15). However, the enacted scheme or design may divert significantly from the intended scheme. Galperin distinguished between "a scheme of the orienting basis of an action" and "the operational scheme" (Lecture 10, p. 15) and observed that "a student, following the outline of your scheme, may not always perform the action" (Lecture 10, p. 16; see also Lund & Hauge, 2011, for an extended discussion). Thus, Galperin placed enacted agency firmly with the student: "I would like to suggest another approach: not to delegate our duties to students, but to find a system of conditions under which students *cannot help mastering the action and, in doing so, learn how to complete/solve other tasks*" (Lecture 10, p. 7,

emphasis in original). Hence, we see how Galperin touched upon questions of transfer and generalisability that have long been problematised in educational research. Throughout the lectures, Galperin connected the potential of generalisation to develop a mental action with learners, which reflects material or linguistic-symbolic mediation (see Lecture 13, pp. 1–6). Galperin never operated with blueprints to be copied but a reconfiguration and contextual transformation where principles are sensitive to contextual features and where "you should also identify potential pitfalls in the designed action" (Lecture 10, p. 7). As a logical consequence, Galperin placed learners' agency at the heart of teaching (see also the section above on transformative agency), which he summed up as follows: "to teach - means to develop the capacity with learners to analyse independently" (Lecture 10, p. 14).

We see here a co-constructive effort in which students and teachers are involved in the design process, aiming to orient students towards potential opportunities for learning and enacting these opportunities in the learning process: "The learner creates a complete scheme of the orienting basis of an action" (Galperin, 2002, Lecture 13, p. 2). By combining social and material resources and connecting collaborative actions and individual mental activity, Galperin outlines a way forward for teachers as designers, not only of tasks, learning environments, and activities, but also of learners' cognitive development. These are essential pedagogic and didactic insights with considerable contemporary relevance.

By designing tasks, learning environments, and activities, the teacher works directly with and within an expanding ZPD, designing a "construction zone" (Haenen, Schrijnemakers, & Stufkens, 2003, p. 264) for the students. In other words, "Galperin extended Vygotsky's 'zone' to include a teaching-learning model of the formation of mental actions" (Haenen, 2001, p. 157). Unlike Vygotsky, who did not expand on the ZPD in light of its instructional implications, Galperin outlined a framework for the teaching-learning processes that takes place in the ZPD. This assigns the teacher a role as an active designer who—based on psychological, pedagogical, subject-specific, and experience-based knowledge—designs opportunities for learning while actively taking part in such designs by co-enacting them with the students as they engage in transformative practical *and* mental activity. Koshmanova (2007), herself a teacher educator, emphasised the significance of introducing such a co-construction in teacher education when she asserted that in Galperin's framework, the teacher provides "the pattern of the orientation base" and "the students themselves work out the acts to be performed in developing certain skills; this

model gives students the opportunity to think more actively and creatively" (p. 82). This division of labour between teachers and students corresponds to the intended and enacted dimensions of design (Lund et al., 2014; Lund & Hauge, 2011).

One of the few studies that connect Galperin's orienting phase with teaching design is Stolk, Bulte, de Jong, and Pilot's (2009) development of a programme for context-based chemistry education. The authors applied Galperin's orienting phase to two designs: one for context-sensitive teaching and one for the design of a course that needs context-sensitive teachers to be operationalised. However, the authors adapted Galperin's detailed and "comprehensive" orienting phase as they operated with a *preliminary* orienting phase for mental action and *expanding* the orienting basis in their design work. We find this study interesting because it locates the designs in the ZPD while opening Galperin's orienting phase towards serendipity and the unexpected, not least when students encounter and participate in the intended designs (see also Lund & Hauge, 2011).

5. Agency, digital artefacts, and teachers as designers in empirical research

Some authors (Engeness, 2018; Engeness & Edwards, 2017; Engeness & Mørch, 2016; Ilyasov & Kostrova, 2017; Page, Thorsteinsson, Lehtonen, & Niculescu, 2008) have elaborated on the notions of agency, digital artefacts, and teachers as designers in empirical research that employs Galperin's pedagogical theory.

For example, Engeness and Edwards (2017) explored the landscape of the digital tools and other mediational means present in classroom learning as well as examined the relationships between these means while supporting students' learning. The support components selected for investigation were digital tools, task design, peer collaboration, and teacher interventions. The analysis used a cultural-historical perspective of learning that allows an examination of how tools—which may be social, linguistic, and material artefacts—operate as mediational means, which carry the meanings that are of value in a culture (Vygotsky, 1980). The article's claim to originality is that the analysis drew on Galperin's conceptual contribution, which suggested seeing learning as the gradual transformation of socially constructed mental activities by identifying dialectically developing forms of socially meaningful activity. These forms of activity, termed by Galperin as phases of the learning process, lie at the core of the analysis in the article. By employing Galperin's categorisation, the study findings revealed that material digital tools, task

design, social peer collaboration, and teacher interventions dialectically interplay to shape how learners use each of the mediational tools: i) digital tools were the resources that enabled students to explicate their (mis)understandings; ii) a compare-and-contrast task promoted analytical thinking; iii) peers presented themselves as resources who promoted the development of conceptual understanding; and iv) the teacher guided learners' attention towards the potential of mediational resources, elicited, organised, and structured students' knowledge. The study argued that the dialectical interplay of these mediational means created a system that supported and guided students' learning.

The recognition of the dialectical relationships in the system of interplaying material and social mediational means draws from and gives support to Galperin's detailed attention to the dialectically linked forms of social activity/phases involved in learning in formal settings. The analysis has shown that in the phases of orientation, materialised action, and communicative thinking, it is the dialectical interplay of material and social mediational tools that shapes how each of them is used by learners. The article (Engeness & Edwards, 2017) suggests that this approach may offer new pathways for the use of Galperin's conceptual contribution in further research exploring the teaching-learning process, design of learning activities, and educational technologies.

In a study addressing the role of the teacher as designer, Engeness (2018) investigated how teachers can facilitate learners' capacity in the writing process with the feedback from the computer-based programme EssayCritic (target class) and the feedback from collaborating peers (comparison class). Cultural-historical perspectives on learning and development (Vygotsky, 1980) and Galperin's conceptualisation of learning (Galperin, 2002; Haenen, 2001; Rambusch, 2006) were chosen to provide an explanation for the different conditions of mediation in both classes and as a lens to examine teachers' facilitating of students' learning in similar forms of activity/phases of the writing process. The findings showed that the teachers in both classes i) set up the writing process in the orientation phase, ii) assisted the development of students' conceptual understanding in the phase of communicated thinking, and iii) brought learners' attention to the essential requirements of the essays in the phase of dialogical thinking. In sum, the teachers fulfilled the orienting, executive, and control functions when facilitating students' writing. On the other hand, Engeness (2018) argued that the presence of the computer-based programme EssayCritic in the writing process affected the teachers' facilitating in the target class: The

instructions given by the teacher were focused on integrating EssayCritic, relying on it, and interacting with the programme over time, indicating that the teacher's dependency on the technology involved a) introducing the technology to learners, revealing its potential, and integrating EssayCritic into students' learning in the orientation phase; b) relying and interacting with EssayCritic when assisting the development of students' conceptual understanding in the phase of communicative thinking; and c) taking advantage of EssayCritic when initiating the learners' reflections about the essential requirements in the phase of dialogical thinking. Moreover, the feedback given by EssayCritic determined the complete orientation of students' learning (Galperin, 2002), providing specific instructions about how to solve the task of writing an essay on the chosen topic with the requirement of a variety of subthemes. The teacher's close interaction with EssayCritic and the specific cues given to students by EssayCritic appeared to be at the expense of the development of students' writing skills and their agentic capacity to control the writing process. Quantitative analyses of teachers' interventions in the writing process revealed that the teachers in both classes offered more assistance in the phases of orientation and communicated thinking than in dialogical thinking, which might indicate that learners require more guidance at the beginning and the middle of the writing process than in its final phase.

In addition, Galperin's forms of learning activity appeared to be helpful as a lens to reveal the dialectics of students' learning and as a tool for examining and conceptualising the nature of teachers' pedagogic interactions with groups of students at different times of the learning process. The findings also showed that the linearity of the transformation from the orientation to dialogical thinking, originally suggested by Galperin, was disrupted by the presence of EssayCritic in the writing process. The recursive nature of students' engagement with EssayCritic might have implications for the design of digital tools and teachers' facilitation of learning activities with technology. Another potential implication for further studies is the importance of Galperin's types of orientation, which provided an explanation for the conditions of mediation in the target and comparison classes. Overall, these findings can inform practitioners about the types of instructions that teachers give when facilitating the writing process, as well as emphasise the importance of teachers' awareness of the type of support that technology provides with the purpose of integrating technology to enhance their pedagogy and student learning.

We finally turn to Page et al. (2008), who developed a pedagogical model for technology education called "Network Oriented Study with Simulations" with a "Web Orientation Agent".

The model was developed to address the serious challenges experienced by students when trying to make sense of complex, multimodal learning environments and tasks. The researchers drew on Galperin's "System of Planned, Stage-by-Stage Formation of Mental Action" (see Podolskij, this issue), particularly the conditions for the necessary orientation of the basis of action. They also explicitly connected digital resources to the orientation phase:

> It is the view of the authors that the Galperian (1989, 1992) or neoGalperian (Podolskij, 1997) approaches to orientation that make use of web-based learning have not been fully realized because the learning process has typically been static, that is statically implemented. We therefore argue that the full potential of the Galperian theory may be found by developing conceptual electronic interactive and web-based tools based on modern ICT e.g. WWW resources. (Page et al., 2008, p. 87)

The authors argued that digital resources enable students "to represent their own thinking in ways that explore, manipulate and experiment with the environment" (Page et al., 2008, p. 91). Thus, both teaching and digital resources were firmly placed in the orientation phase. In sum, this opens up a richer and less predictable or prescribed orienting phase (see also Stolk et al., 2009).

6. Conclusion: The transformative mind

It is fair to argue that Galperin was the first scholar in the cultural-historical tradition to conceptualise in detail the process of teaching and learning (see the concept of "obuchenie" in Engeness and Lund, this issue). In addition, it is important to point out Galperin's methodological contribution to studying the process of teaching and learning as a transformational activity: "Galperin departed from Vygotsky in that, instead of relying on observation methods, Galperin turned to the methodology of active construction of new mental processes by organizing teaching procedures and contexts to guide learners' cognitive growth" (Arievitch & Haenen, 2005, p. 163).

Hence, the "construction of new mental processes" is given a theoretical and methodological foundation that points towards formative interventions and the study of the transformation of both the mind and practices (Sannino et al., 2016). Recently, issues of transformation in developmental learning and teaching have been further developed and operationalised as the transformative activist stance (TAS; Stetsenko, 2017). The TAS draws not only on the pedagogic legacy of the cultural-historical tradition, but also on the Vygotskian, fundamentally democratic, future-oriented, ideological-political ethos that comprises equality and

justice in a new society. According to Stetsenko (2017), this is an issue that has been largely ignored in Western interpretations. Furthermore, such "a transformative worldview with ontological (what is reality taken to be) and epistemological (what the process of knowing about reality is taken to be)" (Stetsenko, 2017, p. 33) implications points towards educational research where the transformation of minds and the transformation of societies find a dialectic unity in the extremely ambitious and bold approaches in Galperin's framework and the cultural-historical legacy.

References

Agostinho, S., Bennett, S., Lockyer, L., & Harper, B. (2011). The future of learning design. *Learning, Media and Technology, 36*(2), 97–99. doi:10.1080/17439884.2011.553619

Arievitch, I. M. (2003). A potential for an integrated view of development and learning: Galperin's contribution to sociocultural psychology. *Mind, Culture and Activity, 10*(4), 278–288.

Arievitch, I. M. (2008). Exploring the links between external and internal activity from a cultural-historical perspective. In B. van Oers, W. Wardekker, E. Elbers, & R. Van der Veer (Eds.), *Transformation of learning: Advances in cultural-historical activity theory* (pp. 38–57). Cambridge, NY: Cambridge University Press.

Arievitch, I. M. (2017). *Beyond the brain: An agentive activity perspective on mind, development and learning*. Rotterdam, Netherlands: Sense.

Arievitch, I. M., & Haenen, J. P. P. (2005). Connecting sociocultural theory and educational practice: Galperin's approach. *Educational Psychologist, 40*(3), 155–165.

Biesta, G. J. J., & Tedder, M. (2007). Agency and learning in the lifecourse: Towards an ecological perspective. *Studies in the Education of Adults, 39*, 132-149.

Bower, M. (2017). *Design of technology-enhanced learning: Integrating research and practice*. Bingley, England: Emerald.

Burbules, N. C., & Callister, T. A. (2000). *Watch IT: The risks and promises of information technologies for education*. Boulder, CO: Westview Press.

Conole, G. (2008). The role of mediating artefacts in learning design. In L. Lockyer, S. Bennett, S. Agostinho, & B. Harper (Eds.), *Handbook of research on learning design and learning objects: Issues, applications, and technologies* (Vol. 1, pp. 188–207). Hershey, PA: IGI Global.

Dafermos, M. (2016). Critical reflection on the reception of Vygotsky's theory in the international academic communities. *Cultural-Historical Psychology, 12*(3), 27–46. doi:10.17759/chp.2016120303

Edwards, A. (2011). Building common knowledge at the boundaries between professional practices: Relational agency and relational expertise in systems of distributed expertise. *International Journal of Educational Research, 50*, 33–39.

Edwards, A. (2017) Cultural-historical approaches to teaching and learning in higher education: Teaching to support student agency. In B. Leibowitz, V. Bozalek, & P. Kahn (Eds.), *Theorising learning to teach in higher education* (pp. 124–138). London, England: Taylor and Francis.

Engeness, I. (2018). What teachers do: Facilitating the writing process with the feedback from EssayCritic and collaborating peers. *Technology, Pedagogy and Education*, 1–15. doi:10.1080/1475939X.2017.1421259

Engeness, I., & Edwards A. (2017). The complexity of learning: Exploring the interplay of different mediational means in group learning with digital tools. *Scandinavian Journal of Educational Research, 61*(6), 650–667. doi:10.1080/00313831.2016.1173093

Engeness, I., & Lund, A. (this issue). Learning for the future: Insights arising from the contributions of Piotr Galperin to the cultural-historical theory. *Learning, Culture and Social Interaction*.

Engeness, I., & Mørch, A. (2016). Developing writing skills in English using content-specific computer-generated feedback with EssayCritic. *Nordic Journal of Digital Literacy, 11*(02), 118-135.

Etelepälto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2013). What is agency? Conceptualizing professional agency at work. *Educational Research Review, 10*, 45–65. http://dx.doi.org/10.1016/j.edurev.2013.05.001
Galperin, P. Ya. (2002). *Lekcii po psikhologii [Lectures in psychology]*: Moscow: Knizhnyy Dom Universitet
Goodyear, P. (2015). Teaching as design. *HERDSA Review of Higher Education, 2*, 27–50.
Haapasaari, A., Engeström, Y., & Kerosuo, H. (2014). The emergence of learners' transformative agency in a Change Laboratory intervention. *Journal of Education and Work, 29*(2), 232–262. doi:10.1080/13639080.2014.900168
Haenen, J. (2001). Outlining the teaching-learning process: Piotr Galperin's contribution. *Learning and Instruction, 11*, 157–170.
Haenen, J., Schrijnemakers, H., & Stufkens, J. (2003). Sociocultural theory and the practice of teaching historical concepts. In A. Kozulin, B. Gindis, V. S. Ageyev, & S. M. Miller (Eds.), *Vygotsky's educational theory in cultural context* (pp. 246–266). New York, NY: Cambridge University Press.
Heim, M. (1987). *Electric language: A philosophical study of word processing* (2nd ed.). New Haven, CT: Yale University Press.
Ilyasov, I. I., & Kostrova, A. V. (2017). Connection between types of learning by P.Ya. Galperin with kinds of thinking in school students. *National Psychological Journal, 3*, 62–75. doi:10.11621/npj.2017.0308
Kaptelinin, V., & Nardi, B. A. (2006). *Acting with technology: Activity theory and interaction design*. Cambridge, MA: MIT Press.
Kerosuo, H. (2017). Transformative agency and the development of knotworking in building design. In M. Goller & S. Paloniemi (Eds.), *Agency at work: An agentic perspective on professional learning and development* (Vol. 20, pp. 331–349). Cham, Switzerland: Springer International.
Koschmann, T. (Ed.). (1996). *CSCL: Theory and practice of an emerging paradigm*. Mahwah, NJ: Erlbaum.
Koshmanova, T. S. (2007). Vygotskian scholars: Visions and implementation of cultural-historical theory. *Journal of Russian and East European Psychology, 45*(2), 61–95. http://dx.doi.org/10.2753/RPO1061-0405450202
Latour, B. (1999). *Pandora's hope: Essays on the reality of science studies*. Cambridge, MA: Harvard University Press.
Laurillard, D. (2012). *Teaching as a design science: Building pedagogical patterns for learning and technology*. New York, NY: Routledge.
Luckin, R. (2010). *Re-designing learning contexts: Technology-rich, learner-centred ecologies*. London, England: Routledge.
Lund, A., Furberg, A., Bakken, J., & Engelien, K. (2014). What does professional digital competence mean in teacher education? *Nordic Journal of Digital Literacy, 9*(4), 281–299.
Lund, A., & Hauge, T. E. (2011). Designs for teaching and learning in technology-rich learning environments. *Nordic Journal of Digital Literacy, 4*, 258–271.
Lund, A., & Rasmussen, I. (2008). The right tool for the wrong task? Match and mismatch between first and second stimulus in double stimulation. *International Journal of Computer-Supported Collaborative Learning, 3*(4), 25–51.
Lund, A., & Vestøl, J. M. (in press). Analytical units of transformative agency: Emergency and emergence. *Learning, Culture and Social Interaction*.
Maina, M., Craft, B., & Mor, Y. (Eds.). (2015). *The art & science of learning design*. Rotterdam, Netherlands: Sense.
Mäkitalo, Å. (2016). On the notion of agency in studies of interaction and learning. *Learning, Culture and Social Interaction, 10*, 64–67. http://dx.doi.org/10.1016/j.lcsi.2016.07003
Page, T., Thorsteinsson, G., Lehtonen, M., & Niculescu, N. (2008). A pedagogical consideration of technology enhanced laboratory work in technology education. *Studies in Informatics and Control, 17*(1), 85–94.
Podolskij, A. I. (2008). Bridging a gap between psychology and instructional practice: Toward applied model-based theory construction. In D. Ifenthaler, P. Pirnay-Dummer, & J. M. Spector (Eds.), *Understanding models for learning and instruction* (pp. 211–223). New York, NY: Springer.
Podolskij, A. I. (2009). On scientific status and practical significance of one psychological theory. In Y. Zinchenko & P. Petrenko (Eds.), *Psychology in Russia: State of the Art* (pp. 187-209). Moscow: Russian Psychological Society.
Podolskiy, A. I. (2014). "There is nothing so practical as a good theory": How to let it work in practice (the case of Galperin's theory). *Psychology in Russia: State of the Art, 7*(3), 4–12. doi:10.11621/pir.2014.0301
Rambusch, J. (2006). *Situated learning and Galperin's notion of object-oriented activity*. Paper presented at the 28th Cognitive Science Society, Mahwah, NJ.

Roth, W.-M., & Lee, Y.-J. (2007). "Vygotsky's Neglected legacy": Cultural-Historical Activity Theory. *Review of Educational Research, 77*(2), 186-232.

Rückriem, G. (2009). Digital technology and mediation: A challenge to activity theory. In A. Sannino, H. Daniels, & K. Gutiérrez (Eds.), *Learning and expanding with activity theory* (pp. 88–111). New York, NY: Cambridge University Press.

Sannino, A. (2014). The emergence of transformative agency and double stimulation: Activity-based studies in the Vygotskian tradition. *Learning, Culture and Social Interaction, 4*, 1–3. doi:10.1016/j.lcsi.2014.07.001

Sannino, A., & Engeström, Y. (2017). Relational agency, double stimulation, and the object of activity: An intervention study in a primary school. In A. Edwards (Ed.), *Working relationally in and across practices: A cultural-historical approach to collaboration* (pp. 43–57). New York, NY: Cambridge University Press.

Sannino, A., Engeström, Y., & Lemos, M. (2016). Formative interventions for expansive learning and transformative agency. *Journal of the Learning Sciences, 25*(4), 599–633. https://doi.org/10.1080/10508406.2016.1204547

Shaffer, D. W., & Clinton, K. A. (2006). Toolforthoughts: Reexamining thinking in the digital age. *Mind, Culture, and Activity, 13*(4), 283–300.

Stetsenko, A. (2017). *The transformative mind: Expanding Vygotsky's approach to development and education*. New York, NY: Cambridge University Press.

Stolk, M. J., Bulte, A. M. W., de Jong, O., & Pilot, A. (2009). Towards a framework for a professional development programme: Empowering teachers for context-based chemistry education. *Chemistry Education Research and Practice, 10*, 164–175. doi:10.1039/b908255g

Säljö, R. (1999). Learning as the use of tools: A sociocultural perspective on the human-technology link. In K. Littleton & P. Light (Eds.), *Learning with computers: Analysing productive interaction* (pp. 144–161). New York, NY: Routledge.

Säljö, R. (2010). Digital tools and challenges to institutional traditions of learning: Technologies, social memory and the performative nature of learning. *Journal of Computer Assisted Learning, 26*(1), 53–64.

Thorne, S. L. (2015). Mediated life activity, double stimulation and the question of agency. *Learning, Culture and Social Interaction, 4*, 62–66. http://dx.doi.org/10.1016/j.lcsi.2014.10.002

Vestøl, J. M., & Lund, A. (2017). Co-configuring design elements and quality aspects in teacher education: A research agenda. In M. Peters, B. Cowie, & I. Menter (Eds.), *A companion to research in teacher education* (pp. 725–739). Singapore: Springer.

Vygotsky, L. (1980). *Mind in society: The development of higher psychological processes*: Harvard university press.

Vygotsky, L. S. (1986). *Thought and language* (A. Kozulin, Trans.). Cambridge, MA: MIT Press.

Wartofsky, M. W. (1979). *Models: Representation in scientific understanding*. Dordrecht, Netherlands: Reidel.

Wertsch, J. V. (1991). *Voices of the mind*. Cambridge, MA: Harvard University Press.