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The Critical Makers Reader: (Un)learning Technology

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C IS FOR...?

Cards for Collaborative Learning of / for / from / about Critical Making

Verena Kuni

C IS FOR...? CARDS FOR COLLABORATIVE LEARNING OF / FOR / FROM / ABOUT CRITICAL MAKING

VERENA KUNI

What Do We Want to Learn Today? If the answer is 'Critical Making', what does that mean? If we think of Critical Making as a practice, couldn't we just jump in, learning by doing? However, wouldn't that mean that we already have an idea of what Critical Making is and how it works? So should we first learn something about Critical Making? If so – and if we want to take our original purpose seriously – shouldn't our learning process be guided by critical reflection about our subject as well? Would that mean our learning process should not so much be about finding answers, but about posing questions? If 'Critical Making' is the answer, what are our questions?

Let's give it a try. Together, let's look at practices, theories, concepts, methods, techniques, and tools associated with Critical Making to find out more. In doing so, we can examine the attitudes or stances that each adopts to Critical Making. We can see what kind of questions they claim to answer by the way they conceive, think, develop, and do Critical Making. Taken together, these should help us learn of, for, from, and about Critical Making. Thus, we could start with mapping our terrain. Based on this mapping, we can create a set of index learning cards that help us to ask our questions.

But how should we map our terrain? Obviously, we will have to do some research, and we will have to decide which methods to use. Addressing our questions directly to Critical Making practitioners would certainly be a great idea. Yet, for a variety of reasons, this option is not always available or practical. Fortunately, there seems to be a valuable alternative. In recent years, a whole body of literature has sprung up, a growing collection of publications dealing with practices, theories, concepts, methods, techniques and tools of Critical Making. So we should consider reading as a solid basis for our mapping.[1] Drawing from a variety of resources will help us to carry out a mapping that is as varied as it is detailed. It will provide us with a rich pool of possible key terms for our index, and a rich pool of materials for our learning cards.

However, even the process of conceptualizing practices should come with critical reflection, shouldn't it? What happens to seemingly neutral processes like mapping and indexing today, when we can read letters not just as language, but as a brand name of one of informational capitalism's biggest global players? What about those languages we're learning anyway? And as long as we're asking questions, shouldn't we also ask about the cards?

As these questions concern the fundamentals of our concept, we will have to explore them first in some detail before we can begin to make our learning cards. Yet in doing so, we'll find out that we are already right in the middle of processing Critical Making. Alas, let's give it a try!

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1   For a suggestion of related readings – which are, for good reason, not limited to publications focusing explicitly on Critical Making as their main subject, but also include reflections on making and on criticality – see Appendix 1: Critical Making Bibliography – Critical Mapping Sources.

C is for...Cards

Why Cards? Cards have a considerably long tradition as learning tools. Most people will be familiar with a widely used sibling of index cards, the so called 'flash card'. In its basic form, a flash card comes as a rectangular piece of paper with a question or a problem on one side and the answer or solution on the other (in the case of language learning, a single word or phrase on one side and the translation on the other). Learning with flash cards is generally considered a drill that helps memorize information through active recall.[2] Obviously, this method of learning makes sense for information we would consider factual and stable (never mind that this is not necessarily always the case), and that we later want to be able to retrieve as knowledge on a subject. That's why flash cards can be helpful tools to learn vocabulary, formulas, numbers, names, terms, taxonomies, orders, chronologies, and the like. And that's why they neatly connect to established 'orders of knowledge', including ancestors of our databases like the card-based systems of the 'Zettelwirtschaft'.[3]

However, it is precisely for this reason that flashcards would probably not be our favored learning tool for Critical Making. Above all, the notion of 'critical' invites us not to take anything for granted in advance, but rather to critically reflect upon our subject, including ideas, theories, concepts, materials, tools, practices, and processes associated with it. As it stands, even the concept of Critical Making varies widely. More than a method, it is also framed as a creative approach, a reflexive practice, a tool for artistic research and design at the interfaces of media, matter and society,[4] an educational tool, and even a learning strategy by itself.[5] With this multitude of definitions, if we seriously think about learning cards for Critical Making, wouldn't we expect a different set of cards and different setups for its many uses?

Certainly flash cards are just one way of using cards as learning tools. Over the past decades, especially within the creative sectors, other types of cards have enjoyed an astonishing rise. One reason for this is the connection between learning and playing that has been recently

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2   While the basic principle refers to traditional memorizing techniques, the use of wooden or paper flash cards in educational context became popular in the late 18th and early 19th century; a prominent introduction to advanced techniques of using flashcards has been provided by the German author Sebastian Leitner in his still popular book *Lernen lernen* ('Learning How To Learn'; later editions come with a slightly different title, *So lernt man lernen*, Freiburg, Basel and Wien: Herder, 1980). Although today there is also related software, analog flash cards are still widely used learning tools.

3   See Markus Krajewski, *Zettelwirtschaft. Die Geburt der Kartei aus dem Geiste der Bibliothek*, Berlin: Kulturverlag Kadmos, 2002. Engl.: *Paper Machines: About Cards and Card Catalogs 1518-1929*, trans. Peter Krapp, Cambridge: MIT Press, 2011. We may well consider extending this perspective into the present as well and count in many contemporary uses of cards, and also the more trendy uses of sticky notes.

4   These aspects are not necessarily to be understood as coming 'all-in-one', as there are different approaches towards Critical Making, and these are focusing on different aspects and/or weigh these differently; for more details see the paragraphs below and the Critical Making Bibliography – Critical Mapping Sources in the appendix.

5   While not always explicitly discussed, this aspect is embedded in the methodological approach of the way Critical Making is introduced in many core publications on the subject; see i.e. Rosanne Somerson and Mara L. Hermano (eds) *The Art of Critical Making. Rhode Island School of Design on Creative Practice*, Hoboken: John Wiley & Sons, 2013; and obviously in this volume.

reinforced by the gamification of almost everything.[6] Other trends might be included along with these: the use of hands-on tools in human-centered, 'user-oriented' and community-oriented design processes;[7] process-oriented cards drawing from experimental and cognitive psychology, including cards used in therapy and coaching sessions;[8] and even divination systems, because they also use cards as media for thinking and making.[9] While many of these uses are not primarily about learning, certain features, properties, and conditions of them may well qualify for being adapted to learning processes. In many cases the interplay between images and words – often an important (if not decisive) part of the card design – contributes to opening up a poly-logic space for thinking and action.[10] Plus, while flash cards are usually addressing an individual learner and conceive learning as a rather solitary process, many other card systems build upon communication, and often also upon action – sometimes explicitly anticipating the application of what is being learned. And the fact that the majority of card systems – just like the majority of card games – develop and engage with a temporary community of players or participants, is another good reason why cards can be considered in particular as a tool for collaborative learning. At the same time, with regard to the different structures of the related 'communities' (obviously, a therapy session or a future telling session differ from a gameplay session, and a group of professional skat players differ from a group of friends and again from a family playing cards), just as in other learning contexts the format will always afford to address questions of power and power-related hierarchies – those embedded in the 'rules of the game',[11] those embedded in the framework of the systems it is installed within, as well as those brought in by the people involved.

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6   See Sebastian Deterding and Steffen P. Walz (eds) *The Gameful World. Approaches, Issues, Applications*, Cambridge, MA: MIT Press, 2015.

7   The most prominent example being the *IDEO Method Cards*; for more information on the cards and other 'tools' related to IDEO's Design Thinking philosophy see https://www.ideo.com/tools; for a nice overview on the subject including historical precursors like recipe cards or Brian Eno's and Peter Schmidt's *Oblique Strategies* cards, see Ola Möller, '82 Creativity Card Decks: Case Studies', 2014, https://methodkit.com/research-method-cards/; for further reading see Christiane Wölfel and Timothy Merritt, 'Method Card Design Dimensions: A Survey of Card-Based Design Tools', in Paula Kotzé, Gary Marsden, Gitte Lindgaard, Janet Wesson, Marco Winckler (eds) *Human-Computer Interaction - INTERACT 2013*, Berlin, Heidelberg: Springer, 2013, pp. 478-486.

8   Here we find a rather broad spectrum ranging from the (in)famous *Zener Cards* used by Karl Zener and Joseph B. Rhine for experimental research on ESP to Eli Raman's *OH-Cards* that are designed as visual storytelling prompters in therapy sessions.

9   It is probably not by chance that the most prominent example, Tarot Divination Cards, due to their considerably rich uses of images and/as metaphors as media for communicative processes, have often attracted artists to either create their own decks and/or use the cards as performative tools. For a recent example, see Denisa Kera's project *Parlor of Futures*, https://futureparlor.tumblr.com/. For a UX-/ persuasive design related emulation-appropriation, see Meriç Dağli, 'A Critical Design Sprint Tool. The Rules of the Cold-Reading Cards', 2017, http://mericdagli.com/project/a-critical-design-sprint-tool.

10   A nice example – and one that also relates to our subject matter – is the set of *Unmaking Cards* designed by Moritz Greiner-Petter as a tool for the IXDM Critical Media Lab (Basel) and RIAT Research in Art and Technology (Vienna)'s 'conversation piece' session 'on maker and hacker culture' at *transmediale* 2016; see https://www.ixdm.ch/portfolio/unmaking-5-anxieties/ and https://www.ixdm.ch/wp-content/uploads/2016/03/unmaking_cards_web.pdf.

11   Not only in reference to games in general and their cultural significance (as explored by Johan Huizinga, Roger Caillois and others), but in our context also in reference to Pierre Bourdieu's 'règles d'art', see Pierre Bourdieu, *Rules of Art: Genesis and Structure of the Literary Field*, trans. Susan Emanuel, Stanford: Stanford University Press, 1996.

Last but not least, one more general point should be made regarding card-based learning systems. Many card systems, including method cards, come as predesigned, ready-to-use cards. But creating the cards yourself is helpful, if not instrumental, to the learning process – a strong argument for not only using cards as tools for collaborative learning, but also for considering the process of conceiving, designing, and creating the cards as part of the learning process. However, while active engagement certainly supports active learning, the quality of knowledge is also bound to the quality of information.

M is for...Mapping

Why mapping? For good reason, Garnet Hertz has proposed 'identifying core metaphors of a field' as a first step for Critical Making.[12] Due to their general relevance for cognition, concepts, communication, and culture, metaphors provide keys for understanding the ways we think, act, and communicate.[13] However, for precisely this reason, it is also impossible to escape their impact. Thus, we have to be well aware that our keys are both keys in a more literal sense, and at the same time *imagines agentes*[14] – directing us and asking for a critical reflection as well. They are both subjects/objects and tools of and for Critical Making.

Therefore, while our project is not about geography, we can draw insight from the concepts (methods, theories, practices...) of critical cartography:[15] we should also acknowledge that 'the map is not the territory it represents'.[16] Our mapping is deeply influenced by the system, the structure of thought, and language itself. Moreover, our mapping will never ever be able to cover the subject matter completely – not even approximately.

Nevertheless, mapping can be a useful step in the course of the learning process. While our primary goal is not to visualize information, in the framework of a collaborative learning process it certainly makes sense to use some simple form of visualization at least. For example, we might write the terms on cards and then arrange the collection on a wall in order to discuss them together. This would also allow us to discuss the pros and cons of different mapping methods used in learning processes. If we compare mind mapping versus concept mapping, for instance, the former can invite us to think about the relations between language and meaning, categorization and hierarchization, while the latter is probably better suited for gaining insight into the different concepts of Critical Making, and it might also help us to look for possible cross references.[17]

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12   See the references in the chapter 'P IS FOR...PROTOTYPES' below.
13   Metaphorology is a field of research with a long tradition and a vast convolute of recommendable readings; for a classic of special relevance here see George Lakoff and Mark Johnson, *Metaphors We Live By*, Chicago: Chicago University Press, 1980.
14   The concept of 'acting images' goes back to the Latin *Rhetorica ad Herrennium* and has been of influence on many theoretical approaches discussing powers and potencies of different classes of images since; there are good reasons to include metaphors in this perspective.
15   See for example Jeremy W. Crampton and John Krygier, 'An Introduction to Critical Cartography', *ACME: An International Journal for Critical Geographies* 4.1 (2005): pp. 11-33.
16   See Alfred Korzybski's much-quoted statement from *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics*, New York: Institute of General Semantics, 1958, p. 58.
17   On knowledge mapping methods in general see: Chaomei Chen, *Mapping Scientific Frontiers: The Quest for Knowledge Visualization*, London, Berlin, Heidelberg: Springer, 2003; on Concept Maps see:

However, as our starting point are the publications about Critical Making, and as we want to end up with a series of head words for our learning cards, we could also embrace the basic principles of semantic mapping, especially as these will also help us with the necessary reductions of our list. Because Critical Making is closely associated with technology, and especially with digital technologies, should we also think about using software? Software for text mining, for instance, would allow us not only to simply retrieve items, but also to automatically export an alphabetical list. Or should we rather refrain from automated processes, not only due to the preference for qualitative in contrast to quantitative evaluation,[18] but also due to the fact that we are aiming to learn of, for, from, and about Critical Making – and thus should bet on human brains and close-readings, rather than relying on machines to do the work?[19]

Taking into account the benefits of active engagement in learning, particularly in a collaborative, group-based process, there are good reasons to choose the latter option for the main part. Thus we would suggest giving more weight to this procedure, and to use automatic procedures rather for a comparative part in the course of the work process, in order to critically reflect upon the implications and effects of human versus machine based – or, perhaps more precisely, computer-aided – mapping. As the mapping of contributions to *Critical Making* [at the intersections of] *Design and Digital Humanities*[20] by Jessica Barness and Amy Papelias shows, combinations of computer-based mappings and visualizations can end up being highly suggestive. Yet, at the same time, both the readability and the interpretation of these graphs remain debatable. First, lists of key terms are identified by automated word frequency analyses of single texts. Then, based on a comparative mining analysis, interrelations between these frequencies are established.[21] What do these interrelations tell us? Do they really provide insight into conceptual interrelations, as Barness and Papelias claim?[22] Or do they rather tell us something about vocabulary – about words rather than meanings, intentions, ideas? Keeping in mind the impact of language and metaphor, we should perhaps not completely foreclose some parts of the former are indeed included in the latter – and certainly these results can 'help to better understand the language used to communicate the concept of critical making'.[23] However, it is probably important to mind the gap.[24]

Joseph D. Novak and D. Bob Gowin, *Learning How To Learn,* Cambridge: Cambridge University Press, 2008 (1984).

18   In case we do not have access to some sophisticated A.I.-based software that has been trained both with our method and with our subject matter, chances for an automated qualitative evaluation are probably not so high. However, it should be mentioned that there is already a lot of trainable software around.

19   To quote the eponymous motto Cornelia Sollfrank chose for her *net.art generator*, see http://net.art-generator.com/.

20   Jessica Barness and Amy Papelias (eds) *Critical Making: Design and the Digital Humanities*, *Visible Language* 49:3 (2015), Cincinnati: University of Cincinnati College of Design, Architecture, Art, and Planning, 2015.

21   For a more detailed description of the process and the software used, see Jessica Barness and Amy Papelias, 'Critical Making at the Edges', in Jessica Barness and Amy Papelias (eds) *Critical Making: Design and the Digital Humanities*, p. 9.

22   Ibid. It is not only arguable whether this method is truly 'qualitative' or rather quantitative (at least to a considerable extent), it is also questionable that the connections made this way are 'structural' and, beyond that, show 'communalities' beyond the use of the vocabulary.

23   Jessica Barness and Amy Papelias, 'Critical Making at the Edges', p. 9.

24   A recommendable reading for raising awareness against these kinds of gaps is Johanna Drucker, *Graphesis: Visual Forms of Knowledge Production*, Cambridge, MA: Harvard University Press, 2014.

Either way, just as a map will differ from the territory it aims to cover, gathering these words is only one step of our work-in-progress. Our decision for an alphabetical order may relieve us of the weight of any further elaboration of the semantic network. However, we still have to decide about the choice of key terms to include, as well as the ones to be selected from the list for figuring as examples for our learning cards. Thus, even if we decide to build upon, say, a small reading list of publications clearly dedicated to our subject, Critical Making, what about the mentioned impact of language? How will we deal with seemingly obvious key terms – 'Critical', 'Making', 'Design', and so on – that are given different meanings by different authors? And how will we deal with different terms used by different authors to name issues we would consider as similar or even the same? What about those terms we would consider to be desperately missing? How will we make our choice?

P is for...Prototypes

Why prototyping? If designing and creating our learning tools ourselves can be considered as a valuable part of our learning process, the answer to this question seems already given. But then, at the same time, doesn't learning also mean 'learning from' – learning from others, and not only from those who are actively engaged in our learning community? Indeed, while we want to take care about the quality of our work, we also want to avoid reinventing the wheel. Here, not only will we benefit from research on our subject, but also on our tools. We should also search specifically for prototypes and predecessors in our field – namely, creating learning cards for Critical Making.

Indeed, ours is not the first attempt to bet on this format in the context of Critical Making. In 2015, three years after releasing his substantial collection of zines on our subject matter,[25] Garnet Hertz developed a prototype for *Critical Making Design Process Cards*, 'built as an aid for technology designers to sketch and prototype new designs that are culturally relevant, socially engaged and challenging of current biases in commercial design'.[26]

While this description seems primarily directed to professional design practitioners, one can easily imagine using the cards for educational purposes, e.g. in classes at design schools. Plus, because Critical Making is their subject matter, we would assume that any use of the cards should initiate learning processes – learning by doing. However, at the core is the design process itself, so the intention is indeed, according to Hertz' own definition, 'to actually build' something by following a four-step approach: '1. Identifying core metaphors of a field; 2. Recognizing what the metaphors exclude or marginalize; 3. Inverting the metaphor to bring the marginalized to the center; 4. Building a new alternative that embodies the inversion'.[27]

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25   See Garnet Hertz (ed.) *Critical Making*, Hollywood: Telharmonium Press, 2012 (pdf edition 2014), http://conceptlab.com/criticalmaking/.
26   See http://www.conceptlab.com/cards/.
27   See the video of Garnet Hertz' Lecture 'Critical Making: Foundations and Processes of Critically Engaged Design Practice', The School of Media Studies at The New School, New York, 9 February 2015, http://smscommons.newschool.edu/understandingmediastudieslectureseries/2015/02/09/garnet-hertz-critical-making-foundations-and-processes-of-critically-engaged-design-practice/.

The prototyped deck provides a setup of exemplary tasks that are generated by a combination of different card types, splitting up the tasks into conceptual components. However, if we come back to Hertz' definition of this process, we find steps 1-3 already contained within the cards themselves. Of course, this doesn't strictly exclude critical reflection, as such reflection can be stimulated both by the tasks and by the design process itself – not to mention that the use of the cards can be framed by an introduction into Critical Making and a discussion of the results.[28] At the same time, it is clear that by using the cards we acknowledge a particular concept of Critical Making – the one Hertz himself has developed – as a given. Thus, if we want to learn more about the concept, its background and its references in different theories and practices, we should probably rely on other resources as well.[29]

But what could a card deck that integrates the first three steps look like? And what about a card deck with a more open approach, one that allows us to learn about how a broader range of Critical Making processes can be developed and practiced?

In 2017, Karvita Arvind and Tulip Sinha Neel from the Shrishti Institute of Art, Design and Technology set out to develop an adaptation of Hertz' process cards that 'could be used in the Art and Design classroom to teach and learn the concepts of Critical Making'.[30] They started in class with mapping the field, and came up with five main categories to focus on – Technology, Materials, Concepts, Time, and Space – each figuring as the centre of a separate mapping.[31] Two flowcharts were sketched out to further explore possible connections between design processes and processes of Critical Making. The former informed the latter, and both were clearly informed by concepts of Design Thinking.[32] Next, three types of cards were developed. Main cards were related to the main categories identified in the first step, and featured a selection of the terms collected during the mappings. Enabler Cards prompted users with design tasks, such as 'sculpt your idea using clay', 'make a moodboard', and 'use electronics and digital media to build your idea'. Finally, Disruption Cards listed actions like 'donate your best concept' and 'critique another group's most preferred idea'.[33]

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28   As it is done in the framework of Hertz' workshops.
29   Hertz' himself mentions 'critical making (Ratto), critical technical practice (Agre), reflective design (Sengers), near futures (Bleecker), critical design (Dunne & Raby), values in design (Nissenbaum), tactical media (Lovink) and adversarial design (DiSalvo)', http://www.conceptlab.com/cards/. The majority of these references can be traced back to his zine edition from 2012/2014, see Garnet Hertz (ed*.) Critical Making*; many of them also (re-)appear in publications by other authors on the subject; see also the Critical Making Bibliography – Critical Mapping Sources in the appendix.
30   Karvita Arvind, 'Cards for Critical Making', *Medium*, 8 September 2017, https://medium.com/two-penny-arcade/cards-for-critical-making-5a62e82fefb1.
31   Karvita Arvind, 'Cards for Critical Making'.
32   More precisely, the main influence seems to be the concept(s) developed by IDEO that have become immensely popular over the past decade (and are meanwhile featured a. o. by Stanford University and the Hasso Plattner Institute with special educational programs); see Tom Kelley, *The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm*, New York: Doubleday, 2001 and Hasso Plattner, Christoph Meinel and Larry Leifer (eds) *Design Thinking: Understand – Improve – Apply*, Berlin, Heidelberg and New York: Springer, 2012. However, it should be mentioned that there are also alternative (and, compared to the former, less business-oriented) approaches to these concepts, see i.e. Nigel Cross, *Design Thinking: Understanding How Designers Think and Work*, Oxford: Berg, 2011.
33   Karvita Arvind, 'Cards for Critical Making'.

Compared with Hertz' cards, this prototype seems to be more open in terms of a broader range of possible concepts of Critical Making in the framework of design processes, and is probably also more clearly directed to collaborative learning processes. At the same time, the rather close link with the popular method of design thinking could be scrutinized. Moreover, the prototype is less clear about the concept of criticality in general, and is also not really outspoken about the concept(s) of Critical Making it builds upon. As mentioned previously, in contrast to both the decks prototyped by Hertz and by Arvind/Neel, the purpose here is not so much to create a set of cards to be used in design processes (whether situated in a classroom or not), but rather to develop a collection of learning cards that provide insight into the various concepts, methods, theories, practices, techniques, and tools associated with Critical Making. With this goal in mind, we need a different approach.

P is for...Proposal

The following paragraphs sketch out a proposal for this process. They are meant as a draft that can be freely adapted, further refined, or even partially or fully rejected. While the proce-dure should also work for individual projects, a collaborative learning process and an active engagement of the collective of learners in the whole process would probably lead to the best results. So this is not about proposing a strict prototype, but about a more open-ended invi-tation into a practice. The critical making of the learning cards is a core part of the process.[34]

As a starting point, we propose a mapping of the field based on Critical Making publications with different approaches,[35] in order to identify key terms related to concepts, methods, theories, practices, techniques, and tools. These will serve as our INDEX(ed) terms for our learning cards.[36] Just like traditional index cards, we can add sources to each card, with QUOTES, NOTES on the context, maybe further references or EXAMPLES to supplement this information, and probably also #TAGS that encourage cross-referencing this term with other terms. At this point we might also feel inclined to pin down a brief DEFINITION in our own words and enhance it with #TAGS as well. Now, our index cards are ready – ready to use as flash cards for learning or to use as reference material for other purposes.

But what about the QUESTIONS we've been pondering above? While definitions backed up by references certainly are useful for getting an overview, wouldn't questions be more appropriate to encourage the development of a critical attitude? If so, will the notorious 5W+1H – who, what, when, where, why, and how help? Or do we need to find more complex questions, such as 'in which context?', 'for whom?', 'related to what', or even 'from which

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34   And this is indeed an attempt (or, if you like, also a proposal) to point out that Critical Making is, after all, a verb: critical making.

35   As discussed above, both 'manual' and 'automated' procedures might work. However, we'd propose a manual mapping that – when it takes place as a collective endeavor – will also encourage and support debates about the sources and the choice of terms retrieved from these.

36   The main sources for the mapping have been collected in a separate bibliography (Critical Making Bibliography – Critical Mapping Sources) that is based on a more extended research bibliography on the subject. It should be mentioned that the selection was deliberately not limited to texts that explicitly and/or literally discuss 'Critical Making'; the list also comprises texts dealing with related concepts.

standpoint'? Will we finally be able to frame a master question, a question to which our keyword is the answer? Or would we prefer instead to activate a multitude of questions? Some of these questions may prompt us to critically review not only our choice of resources and references, but also our choice of INDEX terms and thus ask for further engagement in the CRITICAL MAKING of our learning cards. Let's give it a try...

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