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Learning for life: Designing for sustainability of tech-learning networks of older adults

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Abstract. In today's complex society we need to learn on a daily basis during our whole life, especially when it comes to new digital tools on which our lives are increasingly more dependent. However, the way digital tools are designed is not well adjusted to learning how to use these tools in the later part of life. As a result, many older adults struggle with the integration of digital tools into their daily lives. Recently, older adults started to be involved in design through sustainable participatory approaches. However, this group is very heterogeneous and characterised by varied needs that have to be addressed with a fitting approach that is currently missing in E/CSCW and participatory design. In this workshop we therefore want to bring together different disciplines to develop new approaches that will help us to design for sustainable tech-learning networks of older adults.

Background

“Non scholae, sed vitae discendum est”

Annaeus Seneca, Lucius. Epistulae morales ad Lucilium, CVI.

We must learn not for school but for life: an old latin proverb points to the importance of gaining knowledge which we should use not only within the given educational context but mainly during our regular daily life. Learning for life or life-learning can be described as any learning taking place through daily living. Life-learning is more than training or continuing education (Fischer, 2000). It differs from formal learning, which is organized in specific educational institutions, and non-formal learning, where learning is organized outside of formal educational organizations (Findsen & Formosa, 2011). As Lave and Wenger (1991) have pointed out, life-learning is rather about developing the ability to participate in activities connected to a specific community of practice. People within such a community learn by mutually interacting with each other as well as with the given socio-material environment, the tools and the resources that the community uses (Lave, 1991). This view on learning however considers only people and hence communities which are quite homogenous. Fischer (2001) suggests that learning also takes place when people from different communities of practice get involved in common activities. Furthermore, people can also learn not only when being connected by deeper connections as they might be within communities of practice or interests but even by weaker connections within networks (Brown & Duguid, 2017). However, these kinds of connections are more difficult to sustain than in traditional communities of practice. The "group" of older adults is initially held together only by age and is extremely heterogeneous, e.g. in terms of social class, education or technical skills. Therefore, we consider the activities of life-learning of older adults as such a network of older adults. Networks from which communities (of practices or interests) can grow.

Older adults' technology appropriation

Life-learning during the whole life becomes especially essential today, when the daily life in global society is becoming highly complex, and in turn also requires its members to continually adapt on a daily basis. This is especially true in relation to new digital tools on which our lives are increasingly more dependent. Digital tools hold promising benefits for increasing the quality of life of older adults (Kolland 2014). However, many barriers exist for a successful appropriation of technology, such as usability problems and lacking understanding of needs and preferences of this group (Czaja & Lee 2007). For digital tools to become everyday means to support the wellbeing of older people, it is necessary to open the discussion and research on usage barriers beyond the description of failures in the design of IT products and in requirement analysis. Many older adults struggle with the appropriation of digital tools that could or should support their daily lives. Successful appropriation is influenced by a number of factors, starting with the motivation to engage with technology, the actual use of technology or possibility to get support by relevant stakeholders.

Older adults are not averse to the use of technology per se, but rather to the claim that technology automatically generates a meaningful added value for their lives. Older adults tend to be critical of technology if they do not see the importance of technology in their everyday lives. However, if they see concrete possibilities for its use, their attitude can change and can become motivated to use technology to support their everyday lives (Bengs et al., 2018). Language barriers due to technical and/or English terms can make it difficult to use digital tools. This presents hurdles, especially for people with little technical experience or who do not speak English (Müller et al., 2015). Concerns and fears also inhibit trial and error learning, such as lack of trust and the fear of undesirable costs caused by the use of digital tools and related support services (Müller et al., 2015).

Older adults in practice-based and PD approaches

These circumstances are already being addressed by E/CSCW, practice-based and participatory design approaches. By including concrete usage contexts and involving potential older users in the design process, the aim is to achieve a better fit of digital tools, increased usability and better appropriation (Wulf et al., 2015). Design studies have shown that the low-threshold examination of commercially available technology, which is oriented towards the everyday practices of the older participants, can create common spaces for imagination, where possible uses can then be imagined (Müller & Wan, 2018).

That the appropriation of digital tools and participation and influence in learning processes can be mutually dependent has already been demonstrated in design contexts by Joshi and Bratteteig (2016). If a person feels comfortable using a technical tool and can apply it effortlessly, it enables her to understand and master technical proposals and decisions in participatory design contexts. Understanding and learning in PD projects are important for the successful participation of older people in addition to the appropriation of digital tools. Appropriation of digital devices creates a basis for participation and influence in decision-making. The

successful mastery of processes, in turn, opens up an expanded scope of design that supports the appropriation of technology (Joshi & Bratteteig, 2016).

Applied to the conception of learning spaces for the appropriation of technology, this means that not only the appropriation of technology, but also the ownership of learning processes or the possibility of influencing the learning setting must be considered in order to support the appropriation of digital tools. This results in a demand for novel and participative learning arrangements that not only support older people in the appropriation but also involve them in the design of the learning space. However, this requires not only digital literacy, but also a form of learning process literacy to be addressed.

Interdisciplinary approach to older adults' technology appropriation

As mentioned before, the group of older adults is not homogenous; on the contrary, older adults have very different (not only learning) needs. Hence, supporting learning for life of older adults is a multifaceted challenge that cannot be solved by one discipline only. For researching questions on how to support older adults' quality of life with and without digital technologies, it is worthwhile to bring together scholars from disciplines such as gerontology, anthropology, sociology of later life, special education, social work, care sciences and user-oriented IT research (e.g. in the field of "ambient assisted living"). Fostering interdisciplinary approaches for developing concepts and methods which aim at designing sustainable and meaningful learning spaces for older adults thus seems to be a helpful solution in order to overcome a preoccupation which is predominantly top-down and technology-centric. Recent literature in Science and Technology Studies, but also in CSCW and HCI is criticizing the majority of IT research approaches in the ageing domain for neglecting interpersonal and everyday social aspects in technology-mediated relationships (Toombs et al. 2018). Social and critical gerontology provides important knowledge in regard to e.g. images of age and ageing, of how the heterogeneity of the ageing population may be better addressed when designing interventions (Wahl & Oswald 2016; Wanka & Gallistl 2018). Special education provides perspectives on the specificities of later life learning (Korjonen-Kuusipuro et al. 2019) and qualitative sociology and STS provide knowledge on how to understand interactions with digital technology against the background of a diversity of older adults' life worlds (Kolland 2014). Also, it is worthwhile to consult approaches in care sciences, especially community-based research, especially in regard to "caring communities". Here the cooperation and interaction processes of different local actor groups (the older adults, their social networks, informal and formal care providers, communal actors and others) are of interest and solutions are being sought for on a local level to develop new models of care and for ageing and wellbeing at home. The role which technology may play or not is also an important question which is under investigation and by this, the question of how to support long-term community-based caring and learning relationships among the different actors (Müller et al. 2019).

Recent research on digital tools appropriation by older adults emphasizes that digital tools uptake and appropriation are spanned up in different discourses and tensions between micro- and macro levels (Thimm, 2013). Many of the above

presented studies focus only on the local, interactional level such as an older adult teaching another older adult how to use a specific digital tool. However, the problem of supporting learning for life of older adults is impacted not only by the local level, but also by a meso level (how communities and networks are organized) or even the macro level (national policies, funding strategies, surveys, etc.). To be able to solve the problem of supporting life-learning of older adults in tech-learning networks, we need to attend this problem on all these levels.

Hence, we want to draw on the sustainable participatory approach and complement it by approaches from various disciplines to understand the problem of older adults' life-learning on these three different levels. In this workshop, we are therefore interested in how we can understand supporting learning for life of older adults in tech-learning networks as an interdisciplinary problem that requires a sustainable participatory approach. Our workshop is another step in our continuous work focusing on the issue of aging and life-learning from various disciplinary approaches. This is already a 3rd workshop but this time we want to open up and go more in the direction of the relationships between socio-technical environments, caring communities/networks of practices and life-long learning.

Workshop Goals and Activities

ECSCW and related participatory design approaches have a long history of collaboration with different disciplines. Our workshop hence addresses the issues of how we can better understand and support learning for life of tech-communities of older adults from an interdisciplinary perspective in the context of sustainable participatory design. The workshop participants will therefore have an opportunity to learn about the challenges and opportunities related to learning for life of tech-communities of older adults in the context of sustainable participatory design as well as to reflect over their own disciplinary position in relation to this topic.

Our goal is to discuss the following questions:

- How can we develop theoretical grounds of PD when in interdisciplinary discussion in relation to supporting learning of older adults?
 - Are there concepts from other disciplines that we could adopt?
 - Are there PD concepts that could be extended by other disciplinary approaches?
 - Is it possible to synthesize some of the concepts?
- What is to be done on micro-meso-macro level to support life learning of older adults?
 - A lot of work has been done on the micro level in ECSCW, who is in charge of the meso-macro level?
 - How to create support of older adults' life learning in a sustainable way?
 - How to tackle the tensions between the different levels?
- How do we attend the learning needs of such a heterogenous group?

- How can these needs be approached through an interdisciplinary effort?
- Which approaches do we need that can attend the individual needs of older adults?
- How can we think more specifically of provision of adequate learning support & infrastructure for people with various needs and/or in relation to concepts of “caring communities”

The workshop is planned as a one day workshop. Prior to the workshop, the position papers will be distributed among the participants and they will be prompted to read them. In addition, an online document will be shared among the workshop participants, with the updated structure of the workshop. This document will be also used during the workshop to collect written insights or pictures. The workshop is planned to be highly interactive, so that the workshop participants can fully engage in discussion with each other.

First, the organizers of the workshop will introduce the theme of the workshop and themselves. Second, each position paper will be introduced in a short pitch. The purpose of this section is to remind the workshop participants of the papers’ content as well as familiarize themselves with the other workshop participants. In the next step, we will divide the workshop participants into three groups. Each group will start at a table assigned to one level (micro-meso-macro), where they will discuss the particular level. The participants will document the results of each discussion in the form of bullet points written on post-it notes. After a specific time, the groups will rotate, ensuring that each group is able to discuss each of the topics. After the lunch, the organizers will collect the post-it notes with bullet points and place them on a wall. We will then discuss the main workshop questions in relation to the results from the world coffee discussion. The discussion will be documented by one of the organizers by writing notes in the shared document.

Time	Activity
9:00 - 09:10	Introduction to the workshop
9:10 - 10:30	Short pitches of each participant’s position paper
10:30 - 12:00 (including break)	Theme generation as a world coffee We will collaboratively generate a range of themes in relation to the three levels we want to understand. During this activity, the participants will be divided into three groups. Each group will start at a table assigned to one level (micro-meso-macro). After a certain time, the groups will rotate.
12:00 - 13:00	Lunch break

13:00 - 15:00 (including break)	Synthesis During this activity we will try to answer our questions based on the generated themes.
15:00 - 16:00	Future plans During this activity we will summarize our workshop and discuss what the next steps.

Submission details

To be able to participate in the workshop, participants will be asked to submit a position paper. The position paper should be max 5 pages including references. We encourage the authors to address the workshop themes in their position papers and enrich the discussion by introducing new theoretical or philosophical frameworks and perspectives, empirical examples or methodological reflections. The position papers will be submitted through email. The review process will be shared by the workshop organizers. The submissions will be reviewed and selected based on their quality, match with the workshop theme and the different disciplinary background.

Upon acceptance of the proposal, we will share a call for the workshop contributions on the 15th February 2020. The following deadlines are envisaged:

- 3rd April 2020: Submission of position papers;
- 20th April 2020: Notification of acceptance;
- 4^h May 2020: Camera-ready

Notification of acceptance will be sent in time to allow participants to organise travel to the conference and to avail of early registration rates. The submissions will be reviewed by the organisers.

Concerning publication plans, we will arrange a publication of the position papers in an issue of the International Reports of Social-Informatics (IIRSI) series from the International Institute of Socio-Informatics (IISI) in Bonn, Germany. After the workshop, we plan to initiate a joint text based on the results of the workshop together with the participants who wish to participate.

Organisers' Short Bio

Katerina Cerna, PhD, is a postdoctoral researcher in ACCESS project (<http://access.wineme.fb5.uni-siegen.de/>). She has an interdisciplinary background in sociology, educational sciences, and design-oriented disciplines. Her research interest concerns how to design digital tools and environments so that they support learning and how professional knowing changes in the context of design and use of such tools.

Martin Dickel (M.A. in Social Science) is a member of the Collaborative Research Centre “Media of Cooperation” at the University of Siegen (<https://www.mediacoop.uni-siegen.de/en/>). As a research assistant in the CRC subproject "The Cooperative Creation of User Autonomy in the Context of the Ageing Society" he is interested in the question of how, on the basis of a community-based participatory design approach, older adults can be involved in technology development and how sustainable appropriation infrastructures can be created.

Claudia Müller, PhD, is an Assistant Professor for “IT for the Ageing Society” in the Institute of Information Systems and New Media at the University of Siegen and Professor at Careum University Health, Zurich. She follows a praxeological and participatory design approach for assistive technologies for older people (www.inclusive-ageing.com). Her projects aim at the support and enhancement of social inclusion, mobility and autonomy of elderly people in order to strengthen quality of life and health status in higher age. She is a collaborator in the Siegen PraxLabs approach (www.praxlabs.de), which is based on a praxeological and participatory research paradigm. She is also deputy chairwoman of the expert commission of the Eighth Senior Citizens' Report (Altenbericht) of the German Federal Government, a member of the working group “Alter & Technik” (Age & Technology) of the German Society of Gerontology and Geriatrics e.V. as well as the Interdisciplinary Gerontological Research Network (GeNeSi) of the Research Center “FoKos” at the University of Siegen (<https://www.uni-siegen.de/fokos/>).

Eija Kärnä, PhD, works as a professor in Special Education in the Faculty of Philosophy, School of Educational Sciences and Psychology, University of Eastern Finland. During her career she conducted several multidisciplinary research with researchers from several fields of science (e.g. linguistics, psychology, nursing science, computer science). Her research interests have been particularly in communication and interaction of individuals with severe developmental disabilities and autism spectrum disorders and technology for individuals with special needs.

Vera Gallistl, (M.A. in Sociology) is a university assistant and PhD student in the Department of Sociology at the University of Vienna. She is a PhD fellow at the COST-Action ROSEnet - Reducing Old Age Social Exclusion: Collaboration in Research and Policy and a student member of the international research network Aging + Communication + Technologies (ACT). National and international research projects she is involved in at the moment focus on older artists, old-age social exclusion, living arrangements and the digitalization of later life.

Verena Reuter, (M.A. in Sociology) has been a research assistant at the Institute for Gerontology at the TU Dortmund University since 2012. Her work focuses on, among other things, counselling and care services for people with dementia and their caring relatives, participative research approaches in the development of

(technical) services and support structures appropriate for the elderly, ethical and social aspects of human-technology interaction in care.

Franz Kolland, PhD, is an expert in elderly education, culture of old age and use of new technologies. Ao. Univ.-Prof. Dr. Franz Kolland researches and teaches at the Institute of Sociology of the University of Vienna. He wrote numerous publications (monographs, contributions in commemorative publications or in scientific journals) in the field of education of older people. He is an honorary professor of Gerontology at the Karl Landsteiner University in Krems, Austria, and head of the research unit “Gerontology and Health Research”.

Roberta Bevilacqua, PhD, Scientific Direction, IRCCS-INRCA, Ancona, Italy. She has been working at INRCA since 2008, for several European projects. She has worked as also at the Università Politecnica delle Marche from 2012 to 2016, during which she has participated in the national project “Design for All”.

Heidi Kaspar, PhD, is a social and health geographer and has been working in the research department of Careum School of Health, Kalaidos University of Applied Sciences since 2016 in the fields of aging and transnational health care. Heidi Kaspar's research interests include patient mobility, care work, socio-techno-material interactions and feminist theory.

Ulrich Otto, PhD, was Head of Careum Research from 2014-2019 (since 2019 Careum University of Applied Sciences Health, Research Division). Since 2014 he has been developing the Ageing at Home research programme. His main areas of research: Co-production in the welfare mix, ageing research (social gerontology), social network and support research, innovative forms of residential care, communal forms of housing, interaction of social and technical assistance for older people.

Gerhard Naegele, PhD, received professional training as an industrial manager in Berlin. He has a background in business studies and education, and he earned his PhD from the University of Cologne. He was University Professor (Chair) for Social Gerontology (1992–2013) and Director of the Institute of Gerontology (1992-2016) at the TU/Technical University of Dortmund, Germany. Since January 2017, Gerhard Naegele has been doing freelance work as an independent researcher and policy advisor.

Recruitment and participants selection

To be able to engage with a range of different disciplines, we expect to involve a maximum of 10 papers and 15 participants, excluding the organizers. To recruit participants we will send a call for position papers to all relevant email lists, such as CSCW and HCI, but also more interdisciplinary mailing lists, such as feminist geography, Ageing in Europe, a+ (aging Network in Switzerland), Health

Geography, Participative Health Research (PartNet), STS, Medical Anthropology (Switzerland), and Research Network “Ageing in Europe” of the European Sociological Association. In addition, we will also use the website of the Research Committee on Ageing of the International Sociological Association to spread information about our workshop. Furthermore, we will share the call with partners involved in the EU projects as recruiting means to also involve partners from different disciplines. In addition, we will create a website (<http://bit.ly/39a2RP9>) and use it to inform possible participants through our other networks. We will select our participants if their interests presented in a position paper overlap with our interests presented in this text. In addition, we will try choosing participants across different disciplines to ensure an interdisciplinary approach.

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References

Bengs, A., Hägglund, S., & Wiklund-Engblom, A. (2018): Applying Experience Design to Facilitate Wellbeing and Social Inclusion of Older Adults. *Interaction Design and Architecture(s) Journal - IxD&A*, 36, 11–30.

Brown, J. S., & Duguid, P. (2017): *The social life of information: Updated, with a new preface*. Harvard Business Review Press.

Chen, K., & Chan, A. H. S. (2011): A review of technology acceptance by older adults. *Gerontechnology*, 10(1), 1–12.

<https://doi.org/10.4017/gt.2011.10.01.006.00>

- Czaja, S. J., & Lee, C. C. (2007): The impact of aging on access to technology. *Universal Access in the Information Society*, 5(4), 341–349.
- Findsen, B., & Formosa, M. (2011): *Lifelong learning in later life: A handbook on older adult learning*. Brill Sense.
- Fischer, G. (2000): "Lifelong Learning - More Than Training," *Journal of Interactive Learning Research, Special Issue on Intelligent Systems/Tools In Training and Life-Long Learning (eds.: Riichiro Mizoguchi and Piet A.M. Kommers)*, 11(3/4), pp. 265-294.
- Fischer, G. (2001): "Communities of Interest: Learning through the Interaction of Multiple Knowledge Systems," *24th Annual Information Systems Research Seminar In Scandinavia (IRIS'24)* (Ulvik, Norway), Department of Information Science, Bergen, Norway, pp. 1-14.
- Joshi, S. G., & Bratteteig, T. (2016): Designing for Prolonged Mastery. On involving old people in Participatory Design. *Scandinavian Journal of Information Systems*, 28(1), 3–36.
- Kolland, F. (2014): The benefits of learning in later life: an editorial essay. *International Journal of Education and Ageing*, 3(2), 115-126.
- Korjonen-Kuusipuro K., Pihlainen, K. & E. Kärnä (2019): The intra-action of learning and teaching digital skills - Peer-tutoring as a way to support belonging of older people in Finland. In: Beyond Europe: Boundaries, Barriers and Belonging. Abstract Book 14th ESA Conference Manchester. 2019.
- Lave, J. (1991): Situating learning in communities of practice. In L.B. Resnick, J.M. Levine, & S.D. Teasley (Eds.) *Perspectives on socially shared cognition* (Vol 2, pp. 63-82). Washington, DC: American Psychological Association.
- Lave, J., & Wenger, E. (1991): *Situated learning: Legitimate peripheral participation*. Cambridge university press.
- Müller, C., Struzek, D., Kaspar, H. & Pelzelmayr, K. (2019): *Designing for Sustainable Caring Communities. The CareComLabs Framework*. European Conference for Computer Supported Cooperative Work (ECSCW), Universität Salzburg: Austrian Institute for Technology. Salzburg.
- Müller, C., Hornung, D., Hamm, T., & Wulf, V. (2015): Measures and Tools for Supporting ICT Appropriation by Elderly and Non Tech-Savvy Persons in a Long-Term Perspective. In *ECSCW 2015: Proceedings of the 14th European Conference on Computer Supported Cooperative Work, 19-23 September 2015*,

Oslo, Norway (pp. 263–281). Springer, Cham. https://doi.org/10.1007/978-3-319-20499-4_14

Müller, C., & Wan, L. (2018). ICT-Design in a Complex Moral Universe – Ethnography-based Development of a GPS Monitoring System for Persons who Wander. In V. Wulf, V. Pipek, D. Randall, M. Rohde, K. Schmidt, & G. Stevens (Eds.), *Socio-informatics: A practice-based perspective on the design and use of IT artifacts* (First edition, pp. 363–390). Oxford University Press.

Thimm, C. (2013): Digitale Gleichberechtigung der Generationen – Altern in einer mediatisierten Gesellschaft. In: M. Hüther & G. Naegele (Eds.), *Demografiepolitik. Herausforderungen und Handlungsfelder* (pp. 326-343). Wiesbaden: Springer VS.

Toombs, A., Devendorf, L., Shih, P., Kaziunas, E., Nemer, D., Mentis, H., & Forlano, L. (2018): Sociotechnical Systems of Care. *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing*, 479–485. <https://doi.org/10.1145/3272973.3273010>

Wahl, H.-W. und Oswald, F. (2016): *Theories of environmental gerontology: Old and new avenues for ecological views of aging*. In: V. L. Bengtson und R. A. Settersten (Hrsg.): *Handbook of theories of aging – 3rd edition*. New York: Springer 621-641.

Wanka, A. und Gallistl, V. (2018): Doing Age in a Digitized World – A Material Praxeology of Aging With Technology. In: *Frontiers in Sociology* 3 (6). doi: 10.3389/fsoc.2018.00006

Wulf, V., Müller, C., Pipek, V., Randall, D., Rohde, M., & Stevens, G. (2015): Practice-Based Computing: Empirically Grounded Conceptualizations Derived from Design Case Studies. In V. Wulf, K. Schmidt, & D. Randall (Eds.), *Designing Socially Embedded Technologies in the Real-World* (pp. 111–150). Springer London. https://doi.org/10.1007/978-1-4471-6720-4_7