

## Green Chemistry in the Third Age: Engaging Older Adults in Learning about Sustainability

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**Abstract:** The learning sciences takes a broad interest in learning across lifespans. Yet, there is a lack of research on the learning of older adults and how they engage with pivotal socio-scientific issues. This paper reports on a series of events designed to inform older adults about sustainability. Over 200 participants engaged in discussions with experts around sustainable chemistry. Results demonstrate that these participants learned new things about sustainability and how to mediate environmental concerns.

### Introduction

The learning sciences have long conceived itself as a field that takes a broad interest in learning across contexts and lifespans (National Academies of Science, 2018). Yet, there is a lack of LS research and studies and designs that focus on older adult learners of retirement age. Older adults are the fastest-growing age group globally (United Nations, 2019). Despite their relatively proportion of the population, older adults consistently turn out for elections at the highest rates of any age group. What's more, older adults tend to be more skeptical of key socio-scientific issues, like global climate change, that will impact the world long after they are gone (Reinhart, 2018). While these socio-political concerns are certainly important, at a more basic level we know that a lack of stimulating engagement in learning activities threatens the well-being of older adults—emotionally, socially, and cognitively (Merriam & Baumgartner, 2020). Based on these concerns of improving both the personal and global situation of older adults, this paper reports on the early stages of an exploratory study of outreach efforts to engage older adults in learning activities around issues of sustainability.

### Learning in the third age

Three general perspectives inform this work. First, *critical geragogy* refers to approaches to older adult learning that undermine stereotypes of dependency to promote the idea that learning can and should bolster personal freedom and work towards impact social change (Formosa, 2012). This perspective is especially useful in thinking about how older adults might influence the course of discussion around socio-scientific issues like sustainability. Similarly, the idea of *serious leisure* refers to the use of personal “down time” for dedicating pursuits that enrich both the individual and the society (Stebbins, 2007). There is some work that tries to capture pro-environmental actions as a form of serious leisure (Miller, 2018). Finally, and perhaps most importantly, is the concept of the *third age*, which divides the lifespan into “ages” (*first age* being childhood and school-going, *second* being adult working life, and *third* being old age and retirement) to centralize each group's unique needs and abilities (Laslett, 1987). The idea of older adults needing specific learning activities and engagement has led to the emergence of *The University of the Third Age* (U3A), which is an international movement dedicated to providing continuing education and stimulation to retired members of the community in a non-profit structure. Currently, there are over 1,000 U3A groups in the UK which provide community and activities to over 400,000 members (Third Age Trust, 2018). The learning sciences is in a unique position to research and understand how these groups function, in order to help provide learning activities for older adults around the world.

### Methods

Since 2018, the School of Chemistry at the University of Nottingham has undertaken a programme of events to engage local U3A groups. At these events, U3A members tour the School of Chemistry's carbon neutral research building and learn how sustainable chemistry research was put into practical use in the design, construction and utilization of the building. The groups also hear formal lectures from faculty members about sustainability and participate in informal conversations and presentations from various students about how to become more engaged in sustainability in everyday life. Each U3A group was given a questionnaire to fill out before and after the activities at the School of Chemistry. The design of the questionnaire evolved over time, but generally involved six or seven closed-ended 10-point Likert scale questions and a few additional open-ended prompts. This analysis focuses on 226 respondents. In addition to the before and after questionnaire, participants were sent a follow-up survey which was sent to participants anywhere from three months to a year after their visit. These surveys ask more open-ended questions about whether or not the participant believed they learned anything during their visit, what they may have learned, if they shared information from the activities with others, and whether they changed any day-to-day activities as a result of what they learned.

## Results and analysis

### Before-and-after survey responses

Before the events, some groups were asked to rate their level of science knowledge on a scale of 1 to 10. The mean score was 4.9 ( $N = 170$ ,  $SD = 2.5$ ), which can be interpreted as respondents believing they general have average science knowledge. A paired-sample t-test was performed for all question and showed that there were statistically significant differences for every question before and after the U3A events. This suggests that the U3A events resulted in significant positive shifts for all questions. Fairly dramatic shifts were seen in the respondents' perceived understanding of sustainable chemistry and knowledge of sustainable chemistry research. Views on the importance of chemistry, green chemistry, and chemistry research were high before the event, but still saw a significant shift after. The event also seemed to improve the respondents' views on the environmental impact of green chemistry and the safety of chemistry research. The results suggest that the events had significant impact on the attendees' attitudes toward and understanding of green and sustainable chemistry.

### Follow-up survey responses

Nineteen participants responded to the follow-survey. All but one said they had shared information about the activities to others. The open-ended responses revealed that many of them reported about the activities back to their local U3A members at their regular meetings. When asked if they changed anything about their day-to-day lives following the visit, the participants generally said they already try to live sustainably. Others, however, claimed they had made changes, including "recycling more and certainly thinking more about the clothes industry and recycling." When asked what they learned, participants frequently mentioned details about specific topics discussed during their visits. For example, "that oil is not the only means by which plastics can be made." Perhaps the most salient impression from the responses is that participants valued the intergenerational interactions with the university students. Respondents mentioned the enthusiasm of the students and their own interest in hearing about the work being done by younger people. For example, one participant stated, "they were all very keen to show off their work and to listen. It drove home the importance of maintaining and building intergenerational links." In general, the visits seem to have been both enjoyable and informative for the participants who responded. They claimed to have learned new things about sustainability, which they passed onto friends and families and tried to use to inform their own everyday lives. While this is a small sample, the importance of physical, shareable objects and intergenerational communication can be used to inform later iterations of the U3A visits and with other learning activities for older adults.

## Conclusion

This work serves as a first step in reengaging the learning sciences with the unique needs and perspectives of older adults. The findings here will inform new iterations of the School of Chemistry's outreach efforts with older communities and individuals. It also begins the process of deriving design principles for older adult learning activities — including the importance of shareable objects and intergenerational interaction — that can be used for new activities. To drive home the urgency of such efforts, I will end with a quote from a participant who after effusing about the visit and his passion for sustainability, said that it is up to others, both old and young, to take up these issues as he is "now in my eighties and with lung disease [and] I'm in lockdown, possibly forever."

## References

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