

LEVERAGING AI IN BEHAVIOR CHANGE TECHNOLOGY: TRANSFORMING RECYCLING PRACTICES ON LNU CAMPUS

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ABSTRACT

Inefficient waste separation hampers recycling efforts, causing both environmental and financial challenges. A 2013 study in Borås found that 53% of waste is incorrectly sorted, resulting in an annual loss of 13 million SEK primarily due to logistics costs (Rousta et al., 2013). Additionally, research at Halmstad University showed that while 80% of students consider recycling important, 50% fail to separate waste properly (Holmberg et al., 2014). These findings indicate that existing solutions, including awareness campaigns, education in schools, and digital information centers, are insufficient. Despite decades of investment in sustainability programs, proper waste separation rates in Sweden remain low.

Research at the University of Twente identified three main reasons for improper waste sorting on campus: perceived inconvenience, lack of accessible bins, and insufficient waste management knowledge. Notably, significant improvements can be achieved by addressing even one of these issues (Claes, 2022). Among these, the lack of knowledge is a critical area where innovative solutions can make a substantial impact.

Existing research in behavior change technology for waste separation is limited, with one notable study achieving only a moderate 13% improvement in waste separation (Claes, 2022). However, this increase falls significantly short of bridging the 50% gap between properly and improperly sorted waste. The primary shortcomings of this solution include the considerable time required to manually redesign the digital experience if it fails to effectively address the issue, its limited flexibility in redesigning the experience, and its inability to adapt to different audiences in real-time, particularly when users become disengaged.

This research paper aims to explore whether a digital behavior change tool powered by a generative AI can efficiently improve the waste separation on LNU campus. To address the issues identified, we propose the Trash Recycling AI (TRAI) – a web-based application designed to improve waste separation practices through engaging AI-driven experiences.

TRAI offers high accessibility through QR codes placed at recycling bins, requiring only a phone with internet access. Users can quickly identify the correct disposal bin by scanning a barcode or taking a picture of an item, making it an easy and fast tool

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for those on the go. The full TRAI experience leverages generative AIs participating in a conversation with a user as an engaging persona to deliver waste management information in an entertaining manner. The system analyzes user sentiment and adapts responses to be as engaging as possible, incorporating statistics and motivational elements. Successful interactions include conveying at least one fact about the negative impact of poor waste disposal, one fact about the positive impact of recycling, and providing specific disposal instructions with reasoning.

Preliminary feedback from a diverse group of potential users has been highly positive. We expect high engagement and a significant increase in properly allocated waste on campus.

Our next steps include conducting a controlled experiment with 10 to 20 participants, refining the tool based on feedback, and performing a larger test on the Linnaeus University campus. Efficiency will be measured by the percentage of properly disposed items before and during the tool's availability to assess impact. Engagement will be tracked by the number of successful interactions and instances of early termination.

If successful, TRAI could offer substantial benefits, including efficiency, scalability, modifiability, cost-effectiveness, and minimal maintenance. These attributes make it a promising solution for broader research and adoption, potentially transforming waste management practices in educational institutions and beyond.

Keywords: Behavior Change Technology, Artificial Intelligence, Efficiency, Waste Sorting, Sustainability, Campus Environment

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