

Exploring the Role of Storytelling in Fostering Sustainable Behaviour's: A Scoping Review

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Abstract

Introduction: Climate change, driven by human activities, poses a critical threat to global quality of life, necessitating urgent adoption of sustainable behaviours. Despite increasing awareness, a significant gap remains between knowledge and action. Storytelling, with its capacity to engage individuals emotionally and cognitively, offers a unique approach to bridging this gap. This scoping review investigates the potential of storytelling as a tool to promote sustainable behaviours across diverse populations and contexts. **Methods:** A systematic search was conducted across Scopus and PsycInfo using keywords related to storytelling, sustainability, and participatory methods. Eight studies were selected based on inclusion criteria that included diverse populations and storytelling interventions. Methods included participatory action research, narrative creation, educational drama, and project-based learning. **Results:** The review analysed eight studies involving diverse populations, including children in urban areas and farmers in rural communities. Storytelling interventions enhanced emotional awareness, fostered empathy, and promoted sustainable practices. Effective interventions used co-created narratives, educational drama, and project-based learning to make environmental issues tangible. However, challenges such as the need for adequate resources, tailored storylines, and comprehensive training for facilitators were identified. **Discussion:** Storytelling can bridge the gap between knowledge and action in promoting sustainable behaviours. Effective interventions require careful design, sufficient resources, and trained facilitators. Strengths include the adaptability of interventions and the mixed-methods approach, while limitations such as language barriers and study diversity present challenges. Follow-up measurements are essential to determine the duration of these effects, as most studies assess impacts shortly after interventions. **Conclusion:** Storytelling is a promising tool for promoting sustainability. Addressing challenges and focusing on future research, including integrating storytelling into curricula, can refine interventions to foster sustainable behaviours and contribute to global sustainability.

Keywords: storytelling, sustainable behaviour, participatory action research, environmental education, climate change, sustainable consumption

Introduction

Climate change is a major problem of our time, largely caused by human activities (Meyer & Newman, 2020). It is expected that a warmer temperature will negatively affect the quality of life (Meyer & Newman, 2020), indicating the need for significant changes towards greener living (Mote & Salathe, 2010). Although awareness about the situation is increasing, there remains a significant gap between understanding and practicing sustainable action. The urgency to address unsustainable behaviours has never been more critical, given the escalating crisis of climate change and its potential to precipitate dramatic consequences for the planet and future generations. The significance of this issue is paramount, as humanity faces a critical juncture where the decisions made regarding sustainability versus environmental degradation will significantly impact the quality of life for future generations (Oskamp, 2000). The consequences of climate change are no longer speculative futures but observable realities. From extreme weather events to biodiversity loss, the impacts of a warming planet are both profound and pervasive (Pecl et al., 2017). While the impacts of climate change are well-documented and awareness is growing, exposure to information alone does not necessarily lead to environmentally friendly behaviour (Bushell et al., 2017).

The Role of Information and Behaviour

This gap between knowledge and action is influenced by individual values, information density, and defence mechanisms (Kapeller & Jäger, 2020). To address this challenge, the role of storytelling and story-making as effective communication tools is gaining increasing attention. These approaches are being explored for their potential to engage individuals on a deeper emotional level and foster sustainable behaviour. As an effective instrument of communication, the renewed meaning of narrative has the potential to deepen emotional involvement and give environmental issues a personal face (Shchedrina, 2022). Furthermore, story-making, a concept where narratives are co-constructed or improvised, especially from non-human perspectives, proposes a novel approach in comprehending and evoking empathy with the Earth. Such a technique acknowledges the agency that non-human elements have in our ecosystems, thereby promoting a shift from a human-centred environmental discourse to an eco-centric one (Talgorn & Ullerup, 2023). By employing storytelling techniques, it is possible to enhance comprehension and foster greater compassion for the environment. Storytelling addresses these specific gaps by

translating abstract environmental issues into relatable narratives, thereby motivating individuals to take concrete sustainable actions (Talgorn & Ullerup, 2023). This approach may effectively bridge the gap between understanding and actionable behaviour (Talgorn & Ullerup, 2023). Despite the acknowledged efficacy of storytelling, a substantial gap exists in the understanding of its effective application for influencing sustainable behaviour (Weder et al., 2019).

The Power of Storytelling

The role of storytelling in shaping human cognition and behaviour is well-documented, its utilization within the context of sustainability remains underexplored (Weder et al., 2019). Regardless of growing awareness of sustainability, a significant gap persists between knowledge and action. This gap highlights the complexity of human behaviour and the need for approaches that resonate on a deeper emotional and cognitive level. Storytelling, with its ability to engage individuals emotionally and cognitively, may offer the key to bridging this divide between knowledge and action (Veland, 2018). This potential is particularly crucial given the pervasive nature of unsustainable behaviours and the widespread acknowledgment of their detrimental effects, which underscores the urgency of this research (Monroe et al., 2019). Furthermore, storytelling, as both an art and a mechanism for knowledge transmission, has played a pivotal role in human societies for millennia (Sugiyama, 2017). By transforming abstract environmental concepts into relatable narratives, storytelling can effectively bridge the gap between awareness and action, motivating individuals to adopt sustainable behaviours (Mitra & Sameer, 2022). To fully understand the potential of storytelling in promoting sustainable behaviours, it is important to consider its historical context (Mitra & Sameer, 2022). Storytelling has played a crucial role in various cultures, especially among indigenous communities, where it has been used to impart values of respect, conservation, and coexistence with nature (Isoke, 2013). By examining these historical uses, insights can be gained into how modern storytelling can be effectively adapted to address today's environmental challenges (Wilcox et al., 2013).

Historical Perspectives on Environmental Sustainability

Historically, indigenous communities have demonstrated a profound connection with nature, utilising storytelling to convey values of respect, conservation, and coexistence with the natural world. This historical perspective underscores a significant shift from an inclusive, narrative-based relationship with nature to a contemporary scenario characterised by

disconnection and exploitation (Fernández & Cabeza, 2018). The historical indigenous approach versus how the people nowadays live highlights a shift from sustainable coexistence with nature to a paradigm of exploitation and disconnection, emphasising the need to reclaim and integrate narratives into modern sustainability efforts (Hill et al., 2012). The historical indigenous approach to living emphasized a sustainable coexistence with nature, where communities lived in harmony with their environment, utilizing resources in a manner that allowed for regeneration and long-term ecological balance. By drawing on these historical practices, modern storytelling interventions can be designed to foster similar values of sustainability and environmental stewardship (Andriopoulou et al., 2021).

Effects of Globalization and Modern Agriculture on Sustainability

In contrast to historical sustainable practices, modern lifestyles, especially post-globalization, have shifted towards a paradigm of exploitation and disconnection from nature. This shift underscores the need to integrate narratives into contemporary sustainability efforts to address the growing environmental crisis (Hill et al., 2012). One of the key drivers of this change is globalization, which has accelerated the shift by promoting industrial agriculture, unsustainable consumption patterns, and urbanization (Nathaniel et al., 2020). Globalization has accelerated this shift by promoting industrial agriculture, unsustainable consumption patterns, and urbanization. Traditional farmers often practiced environmentally friendly methods such as crop rotation, polyculture, and the use of natural fertilizers (Sihi et al., 2017). Sustainable farming, as defined by Park (2007), includes practices like crop rotation, the use of animal manures instead of chemical fertilizers, and reliance on animal power rather than machines. These practices help maintain soil fertility, reduce reliance on synthetic inputs, and promote biodiversity, thereby contributing to long-term ecological balance and resilience. However, modern agricultural practices frequently prioritize yield over sustainability, relying heavily on chemical fertilizers, pesticides, and monoculture, which degrade soil health and biodiversity (Gomiero et al., 2011). This change has resulted in significant environmental degradation and loss of traditional agricultural knowledge (Bai et al, 2018). Storytelling can help address these issues by reviving traditional agricultural knowledge, raising awareness of the environmental impacts of modern practices, and inspiring sustainable consumption and farming (Darnhofer et al., 2010). Similarly, consumer behaviour has evolved towards unsustainable consumption patterns, driven by the availability of mass-produced goods and a culture of disposability (Lorek

& Vergragt, 2015). This shift contrasts sharply with indigenous practices that emphasized minimal waste and the sustainable use of resources (Redman & Redman, 2014).

Consumer Behaviour and Urbanization

Modern consumerism has led to increased waste, resource depletion, and environmental pollution, highlighting the urgent need for more sustainable consumption practices (McDonald et al., 2009). Urbanization further compounds these issues. In urban areas, the implementation of sustainable practices is gaining momentum through urban farming, which has emerged as a viable solution to address food security and sustainability challenges in cities. However, urban farming faces several significant obstacles, including limited space, inadequate access to resources, and a lack of sufficient knowledge among urban populations (Gehzeljeh et al., 2022). To overcome these challenges, it is essential to empower urban communities by providing education and resources that facilitate engagement in sustainable urban farming practices. Storytelling can play a crucial role in this empowerment by making the benefits of sustainable practices relatable and engaging (Kang, 2018). By integrating storytelling into educational and community initiatives, it is possible to change consumer behaviours and promote sustainable urban practices, thus addressing the dual challenges of consumerism and urbanization (Kang, 2018). Such empowerment can help mitigate these barriers and enhance local food production (Gehzeljeh et al., 2022).

Storytelling as a Tool for Sustainable Environmental Practices

Moreover, the scientific community, particularly in fields like drought science, emphasizes the importance of empowerment and competence in dealing with global issues (Liguori et al., 2021). Educating citizens on these topics is crucial for fostering a population that is not only aware of but also capable of addressing and adapting to challenges like climate change and water scarcity (Lavonen, 2022). This involves integrating traditional knowledge with modern scientific approaches to develop holistic and sustainable solutions. The application of storytelling to environmental sustainability entails the creation of narratives that incorporate non-human perspectives and emphasize the interconnectedness of natural elements. This approach fosters a profound sense of connection and responsibility towards the environment. Storytelling interventions are situated within the broader context of climate change mitigation and adaptation strategies, demonstrating their potential to catalyse significant shifts in behaviour towards more

sustainable practices (Moezzi et al., 2017). Additionally, these interventions can shift the emphasis from merely promoting connectedness to the environment to understanding what constitutes our environment. This involves creating awareness of what belongs to our environment and moving away from an egocentric human perspective to consider the perspectives of the living beings affected by our behaviour. It is precisely in this step that storytelling offers a unique advantage. It creates awareness and facilitates a change in perspective, which is difficult to achieve through knowledge transmission alone (Leeuw, 2019). Non-human perspectives and environmental narratives offer a means to reframe our relationship with the natural world, not as dominators but as co-inhabitants and stewards.

Objectives and Scope of the Study

To address the existing knowledge gap, this study identifies and analyses the theoretical foundations of using storytelling to promote sustainable behaviour. Through a comprehensive literature review, sustainability is evaluated through various behaviours: environmentally friendly farming, sustainable consumption, urban farming, empowerment in drought science, and addressing global challenges. These behaviours collectively foster a more sustainable society by advocating for practices that are ecologically sound, economically viable, and socially equitable (Singh et al., 2019; Mali et al., 2023). Analysing population characteristics is crucial for understanding why specific populations were selected and how they influence sustainable behaviours (Rainham & McDowell, 2005). Diverse populations, such as school children in urban Indonesia and farmers in rural Denmark, present unique challenges and opportunities (Mertz et al., 2005). School children are at a formative stage where they can be highly receptive to new ideas, making it crucial to introduce concepts of sustainability early in their development. Tailoring age-appropriate content for this group can foster lifelong sustainable habits. On the other hand, farmers play a critical role in implementing sustainable practices due to their direct impact on agriculture. While they may benefit from practical sustainability applications, there can be resistance to changing traditional practices (Ebersbach & Brandenburger, 2019). Understanding the characteristics and needs of these demographics is vital for assessing the impact of interventions and identifying which groups are most receptive to storytelling methods. This knowledge provides valuable insights for designing future studies and interventions. By examining the receptivity and perceptions of different societal groups, interventions can be tailored more effectively, ensuring that specific workshops address the unique needs of each

group, thereby enhancing the overall impact on sustainable behaviour change. The diversity in study and intervention designs highlights the iterative and experimental nature of this research. Analysing these designs reveals effective methodological approaches (English et al., 2011). Assessing the effectiveness and feasibility of the interventions involves evaluating their success and practical difficulties, including both success factors and limitations. Understanding participant enjoyment and engagement is crucial in evaluating the acceptance of storytelling interventions, as these positive experiences can significantly contribute to sustained behavioural change (Lewis et al., 2016). Given the novelty of using storytelling to promote sustainable behaviour, evaluating how participants perceive and engage with these methods is essential. Since this is a relatively new area of research, these insights are crucial for developing more effective future studies and workshops. The current landscape lacks comprehensive systematic reviews and studies on storytelling as a tool for promoting sustainable behaviour. This gap underscores the necessity of conducting this scoping review to synthesize diverse approaches and highlight common themes and unique findings across studies. By providing a comprehensive understanding of current research, this review aims to suggest ways to enhance storytelling interventions. The diversity of study designs necessitates an individualized analysis, as current research does not offer a sufficient basis for a thorough comparative analysis (Weder et al., 2019) by presenting what has been done and how, alongside specific measurement types, initial insights can be drawn into the effectiveness of these interventions (Concato, 2013). This approach enables a detailed understanding of each study's unique contributions and limitations, setting the stage for more refined future research (Teixeira et al., 2023).

Guided by the overarching goal of understanding storytelling's role in promoting sustainable behaviour, this review poses the following research questions:

1. *“What criteria and rationale did the authors use to select the populations for their research?”*
2. *“What unique design choices characterize the interventions, and how do they address participants' needs and research objectives?”*
3. *“According to the authors' measurements, how effective and feasible are the interventions, and what are the key success factors and limitations?”*

4. *“What similarities and differences exist across the studies, and what trends and tendencies can be identified to inform future research?”*

Methods

This study adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines outlined by Moher et al. (2009) and the PRISMA extension for Scoping Reviews, ensuring a rigorous and transparent approach. Scoping reviews are conducted to map existing research, clarify key concepts, and identify research gaps (Munn et al., 2018). Following these guidelines, this scoping review identified, selected, and critically appraised relevant research and collected and analysed data from the included studies. The primary databases selected for the literature search were Scopus and PsycInfo. These databases were chosen due to their extensive coverage of psychological and interdisciplinary research, crucial for encompassing the broad thematic elements relevant to narratives and sustainability.

Search Strategy

The search strategy was designed to address the complexities of the themes. It incorporated three main conceptual frameworks, each enriched with various synonyms to ensure a broad capture of literature. Boolean operators were strategically employed to refine the search, structured around the following pillars:

1. Primary Concept: Story and Narratives

- Keywords such as "story*" and "*narrative" were used, with asterisks acting as wildcard characters to encompass all derivatives of these terms, including "storytelling", "story-making", "eco-narrative", and "personal narrative".

2. Framework: Sustainability Contexts

- This segment incorporated terms linked to sustainability, augmented with synonyms like "nature-inclusion", "non-human", and "ecological", aimed at capturing a diverse array of studies related to environmental sustainability.

3. Setting: Application Domains

- The analysis focused on practical applications in various settings:

- **Type A (Activities):** Covered interventions, programs, or workshops that employ narrative techniques.
- **Type B (Study Design):** Included participatory, experiential, and co-creative intervention methods.
- **Type C (Participants):** Focused on literature involving users, stakeholders, citizens, or participants, emphasizing studies that feature substantial user and stakeholder inclusion.

The search was operationalized by sequentially combining the identified concepts with their respective synonyms and keywords. This iterative approach began with individual searches for each concept, progressively integrating them to refine the search string. The goal was to initially retrieve between 100 and 300 articles per database, ensuring a comprehensive yet manageable body of literature for analysis. This range was chosen based on systematic review guidelines, which suggest that an optimal number of articles should be sufficient to allow for thorough analysis without overwhelming the reviewer (Rao & Moon, 2021). Additionally, this benchmark aligns with previous theses supervised in the field, which also targeted a similar range of articles per database, ensuring feasibility within the given scope and time constraints of the study. This approach balanced comprehensiveness and practicality, enabling a detailed and focused review process. This decision was informed by best practices in scoping reviews, which suggest targeting a range that provides sufficient breadth without compromising the depth of analysis. Additionally, the benchmark of 100-300 articles was established based on internal discussions among the researchers and comparisons with previous theses supervised, indicating this range as both practical and effective. Adjustments were made based on the relevance and volume of results to align with the research objectives, ensuring that the final selection of studies was both comprehensive and focused (Bramer et al., 2017). The search process employed for this scoping review was both iterative and systematic, aiming to strike a balance between breadth of coverage and manageable volume of literature. Initially, individual concepts were searched; however, this approach yielded an excessively large number of results. To refine this, the concepts were combined, but this still resulted in 727 articles, which was deemed too extensive for thorough analysis. To further refine the search, synonyms for each concept were methodically integrated into the search string. Initially, it was hypothesized that the most frequently searched

synonyms would yield the highest number of relevant articles. Contrary to expectations, this approach did not produce the anticipated results, prompting further adjustments to the search strategy. Recognizing the potential for an uneven number of synonyms to skew the results, a balanced approach was adopted by integrating two synonyms for each concept. This adjustment proved too restrictive, narrowing the results down to just 45 articles. Consequently, various combinations of synonyms and search terms were tested iteratively to approximate an ideal result count. This optimization process led to adopting a final search string that produced 223 results in Scopus and 254 in PsycInfo. These results were deemed optimal for initiating a detailed analysis, balancing the need for a comprehensive review with the practical constraints of a focused analysis. Additionally, these numbers were the closest to the target of 300 without exceeding it, aligning with the benchmark set by previous theses supervised in the field and ensuring the feasibility of an in-depth review process. The screening process comprised title and abstract screening, culminating in the full-text examination of selected articles. This multi-stage screening ensured that only the most pertinent studies were included, addressing the research questions effectively while maintaining rigorous academic standards. Due to significant disparities in the yield of results between Scopus and PsycInfo when applying the same search string, it was necessary to adapt the search strategy to suit each database's characteristics. In PsycInfo, the initial search string led to an insufficient number of relevant articles (only 42), indicating an over-narrowing of search criteria. Upon review, terms such as "activity" and "participatory" were excluded from the PsycInfo search string to improve relevance. This refinement ensured the search results more accurately reflected the focus on sustainable behaviour interventions, increasing the likelihood of capturing richer qualitative data pertinent to the study's aims (Higgins & Green, 2011). The decision to employ different search strings for Scopus and PsycInfo was driven by the need to optimize search outcomes within each database's operational constraints. This approach is justified by the principle of database specificity, where search strategies are tailored to each database's unique content, structure, and indexing to maximize the relevance and coverage of literature (Aromataris & Munn, 2020). Furthermore, the iterative nature of this search strategy aligns with best practices in systematic and scoping reviews, advocating for continuous refinement of search parameters based on initial findings and database characteristics (Booth et al., 2016). This dynamic approach facilitates a more targeted

and effective literature search, which is crucial for addressing complex research questions in emerging fields of study.

Search string

Given the differences in database characteristics and the initial volume of search results, tailored search strings were developed for each database to ensure optimal retrieval of relevant articles. For Scopus, a more detailed search string was utilized: "story* OR *narrative AND sustainable* OR nature-inclusive OR non-human OR ecological AND intervention OR program OR workshop OR activity AND participatory". This string was designed to capture a wide array of studies relevant to the thematic scope of this review, particularly focusing on participatory approaches within the specified contexts. Conversely, the search string for PsycInfo was crafted to be broader, given the database's smaller scale and scope: "story* OR *narrative AND sustainable* OR nature-inclusive AND intervention OR program OR workshop". This approach was intended to compensate for the expected lower yield of studies by broadening the criteria, thus capturing a wider spectrum of relevant literature without stringent study design specifications. This differential approach in search strategies was strategic, acknowledging PsycInfo's limitations in terms of volume compared to Scopus. By simplifying the PsycInfo search string and omitting specific study design requirements, the review aimed to include a diverse array of studies, ensuring comprehensive coverage across both databases without excessively narrowing the scope of literature included in the review. To support the suitability of the search strings used in both Scopus and PsycInfo, a test was conducted to ensure they accurately captured articles closely aligned with the research focus. Specifically, the presence of the article "Invoking 'Empathy for the Planet' through Participatory Ecological Storytelling: From Human-Centred to Planet-Centred Design" was checked within the search results. This article is highly relevant due to its emphasis on methodologies and story-making, central to the research objectives. Including this article in the search results serves as strong evidence that the search criteria, including the specific synonyms chosen, were appropriate. This confirms that the search strings were neither too broad nor too narrow, successfully identifying literature that matches the research goals. This approach ensures that the search parameters are well-adjusted, capturing key texts while filtering out unrelated material, thus keeping the literature review focused and methodologically sound. By validating the search strings with this relevant article, the effectiveness of the search strategy is confirmed, ensuring that the results are not only of a

reasonable number but also of high relevance to the research objectives. This method acts as a double-check, ensuring the comprehensiveness and accuracy of the search strategy. Due to the employment of distinct search strings tailored to each database, two separate literature analyses were conducted. This bifurcated approach was facilitated using Covidence, a software specifically designed for systematic reviews. Covidence supports various stages of the review process, from initial screening to detailed data extraction. By leveraging this tool, the study ensures a streamlined and efficient review process, allowing for systematic screening of titles, abstracts, and full texts, as well as thorough extraction of relevant data. This methodology not only enhances the accuracy of the literature review but also significantly improves the manageability and reproducibility of the analytical phases.

Inclusion Criteria

To ensure the relevance and quality of the articles included in this review, several inclusion criteria were established. Firstly, only articles based on original research were considered. This criterion ensures that the findings and conclusions presented are the result of the authors' primary investigations rather than reviews or secondary analyses. Additionally, it was essential for the articles to be published in peer-reviewed journals. Peer review serves as a critical quality control mechanism, ensuring that the research has been evaluated and validated by experts in the field before publication. This criterion helps maintain the integrity and credibility of the literature reviewed. Only articles published in English or German were included, as these are the languages the researcher is proficient in. The nature of the programme or workshop described in the studies was also a key consideration. Specifically, the studies had to utilize a co-creational or participatory design, such as interventions or workshops where participants are actively involved in the creation or implementation process. This focus aligns with the review's aim to explore the impact of participatory storytelling interventions on sustainable behaviour. Descriptive studies were included to provide a comprehensive understanding of the context and applications of storytelling within these interventions. By examining descriptive studies, the review aims to capture a broader picture of how storytelling is used and its potential benefits. Furthermore, the inclusion criteria required the studies to involve various forms of storytelling, including creative and fictional narratives. This criterion ensures a rich and diverse exploration of storytelling methods. Depending on the quantity and quality of the results obtained, the focus may later be narrowed to allow for a more detailed analysis and

comparison of different storytelling forms.

These criteria collectively ensure that the articles reviewed are of high quality, relevant to the research objectives, and diverse in their methodological approaches and storytelling forms.

Exclusion Criteria

To refine the pool of articles, the study applied several exclusion criteria tailored to the specific needs of the research focus. Articles focusing on media and communication that did not directly relate to sustainability themes were excluded to maintain a clear focus on sustainability-related narrative interventions. Additionally, the review excluded studies that lacked concrete evaluations or measurements of sustainability outcomes, as the inclusion of such metrics was deemed crucial for assessing the impact of narrative strategies. Studies centred solely on system solutions, policy-making, or social networks without incorporating narrative or storytelling interventions related to sustainability were also omitted. This ensured that the narratives reviewed were directly applicable to sustainability interventions. Non-article formats such as books and other extensive formats were excluded due to their extensive nature and impracticality for detailed review. Furthermore, studies that merely recounted historical or factual events without creative or fictional narrative elements were filtered out to emphasize research involving imaginative narratives designed to foster empathy toward non-human elements or the planet.

Study selection

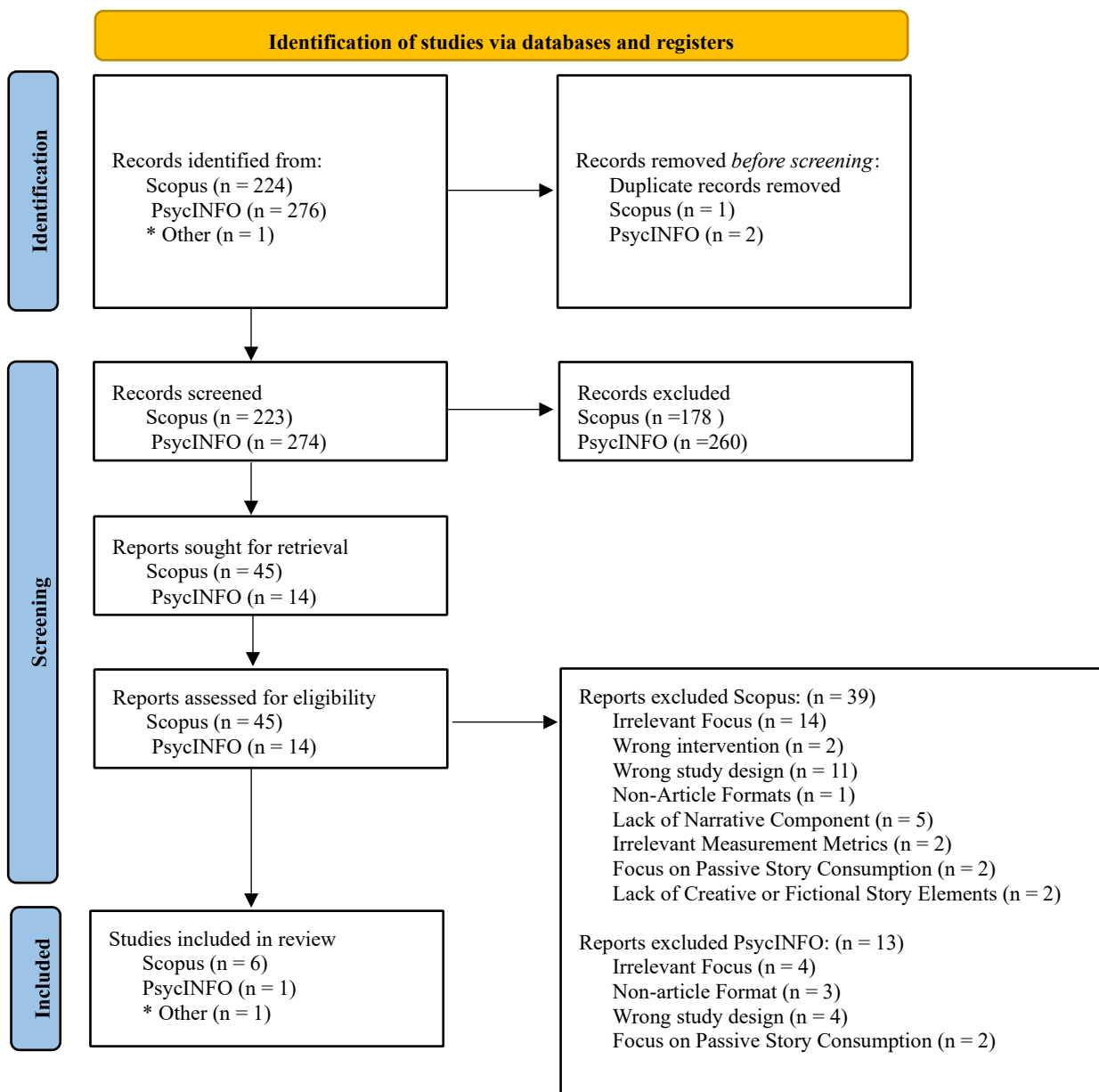
The screening process for this scoping review was conducted by a single researcher and followed a structured approach in line with PRISMA-ScR guidelines, which are critical for ensuring transparency and rigor in scoping reviews (Moher et al., 2009). Utilizing Covidence software, the researcher managed the review process, which began with the importation of references from Scopus and PsycInfo into separate accounts to accommodate the tool's limitations on screening capacity per account.

Duplicates were manually removed, leaving 223 unique references from Scopus and 274 from PsycInfo for title and abstract screening. Following rigorous full-text reviews, 6 studies from Scopus and 1 from PsycInfo were selected based on their relevance to narrative approaches in sustainability. The initial selection yielded 7 articles, prompting a need for further manual searches to reach the target of 10, ensuring comprehensive literature coverage while balancing depth and feasibility (Haddaway et al., 2015). To meet this objective, a supplementary search

strategy was employed, focusing on participatory interventions and their impact on sustainability behaviour. This involved using the "Invoking 'Empathy for the Planet' through Participatory Ecological Storytelling" study as a benchmark. A dual AI system, utilizing GPT-4 and Consensus, was deployed to refine the search process. By extracting keywords from relevant texts, the AI tools identified five closely aligned articles, from which two were excluded due to misalignment with the inclusion criteria. The remaining articles underwent thorough review, resulting in the inclusion of one additional study, "Towards 'Creative Participatory Science': Exploring Future Scenarios Through Specialist Drought Science and Community Storytelling." This methodological extension, incorporating AI tools and targeted searches, enhanced the review's depth and ensured alignment with the research's thematic focus. By blending traditional systematic review techniques with innovative AI-assisted methods, this approach maximized the relevance and quality of the research corpus. The process underscored the need for additional sources due to low information density in some articles, with all included studies meticulously vetted against predefined criteria.

Figure 1

A flowchart showing the process of the study selection for the scoping review according to the Prisma guidelines (Moher et al., 2009)



* Note. The category "Other" refers to the single article identified outside the systematic search strategy and, consequently, not included in the defined search string or the specified databases.

Data Extraction

In this review, a thorough analysis of the relevant literature was conducted to align with the stated research goals. Various publications were meticulously examined, with key information such as participant details, elements of study design, and research outcomes being extracted. All data extraction was carried out consistently by the researcher. The process started with documenting the settings of the studies, including the locations and the designs utilized. The evaluation methods and the reasoning behind the selection of variables were critically assessed.

Each method of evaluation was noted for the range and frequency of measurements taken during interventions, as well as the duration for which data were collected. A concise summary of the tools and metrics employed in these evaluations was also compiled. Furthermore, demographic and other pertinent characteristics of the study populations were analysed. Data on the total number of participants were extracted to understand the scale of the studies comprehensively. Specific demographic information, such as the ages and genders of the participants, was collected. The immediate effects and outcomes of the interventions were evaluated to assess their feasibility and initial impact. This examination included the use of narrative techniques and suggestions for workshops, providing additional context to enhance the understanding of the primary research objectives. Finally, a synthesis of the findings highlighted the methodological robustness and the immediate effectiveness of the interventions, focusing on measurable outcomes and the criteria for evaluating their success.

Integration of AI Tools

In this research, Artificial Intelligence (AI) tools were utilized at different stages to improve the quality and clarity of the thesis. Specifically, language and grammar tools were employed to enhance the accuracy of the writing and to ensure that the academic writing style was clear and coherent. These tools were used to check for grammar and spelling errors and to refine the readability of the text, in consultation with the supervisor to ensure alignment with academic standards. Additionally, GPT-4 in combination with Consensus AI was used to include one additional article and enhance the breadth of the literature review (see “Study Selection,” p. 17). To comply with the University of Twente's guidelines on the use of AI in educational assignments, the specific tools and purposes have been documented in the appendix of this

thesis. This practice not only maintains transparency but also upholds academic integrity by acknowledging the contributions of AI-language tools in the work.

Results

The results section offers an in-depth analysis of the included studies, focusing on population characteristics, research and intervention design, and the effectiveness and feasibility of interventions. Each study is presented individually, considering the diversity in country, population, study design, measurements, and sustainability aspects, ensuring an accurate representation of findings. The "Characteristics of Population" section details the demographics and context of participant groups, contributing to an understanding of the interventions' impact and applicability. The research and intervention design section examines varied methods developed with specific aims and participant needs in mind, creatively applying storytelling and story-making to ensure participant involvement and meaningful learning. The effectiveness and feasibility assessment evaluates how well each intervention achieved its objectives, considering success factors and limitations. Practical difficulties in different settings are discussed, assessing replicability and scalability. The comparative analysis synthesizes differences and similarities across the studies, highlighting common themes and unique findings, offering insights into recent research and reflections on intervention effectiveness. Particular attention is given to participant reception and needs, crucial for the success of behavioural interventions. This structured approach presents findings clearly, identifying gaps and suggesting future research directions to enhance the effectiveness of storytelling and story-making interventions in promoting sustainable behaviour.

Table 1. Study characteristics

Author (Year)	Study Design	Participants and Population Characteristics	Setting	Outcome measures	Data collection methods	Study goal
Marks et al. (2023)	Youth Participatory Action Research (YPAR)	6 pupils: Sixth-form students (aged 16-18 years), mixed genders, and climate concerns	South West, UK	Emotional tone, eco-emotions, mechanisms of hope	Thematic analysis of workshop transcripts, sentiment analysis using text analysis software, post-workshop surveys	Explore young people's eco-emotions, develop mechanisms of hope through co-created workshop
Talgorn & Ullerup (2023)	Mixed-method participatory workshops	66 total: 31 students, 10 senior students, 25 business stakeholders (design students, senior students, professionals, multinational company employees)	Netherlands and International	Emotional engagement, critical thinking, creativity	Thematic analysis of participant-created stories and personas, feedback from individual questionnaires	Develop critical thinking, creativity in storytelling with focus on ecological & sustainable themes.
Arief et al. (2022)	Participatory Action Research (PAR)	94 total: 74 children, 5 housewives, 5 teachers, 2 doctors, 8 company officers (elementary school children and their parents + other stakeholders)	Bandung, Indonesia	Awareness and practices related to urban farming and environmental stewardship	Participant observations, formal meetings, informal discussions, telephone conversations, workshops, video storytelling	Introduce, educate students on sustainability through the "Bio-based Experiential Learning" program

Donovan (2016)	Participatory Action Research (PAR) with co-design	60 children: Children aged 11-13 from a public primary school	South Australia	Understanding of consumption and sustainability, engagement levels	Analysis of visual narratives, individual questionnaires, thematic analysis of content	Engage children in co-designing visual narratives about consumption and sustainability
Liguori et al. (2021)	Mixed methods research incorporating PAR, qualitative scenario development, and interdisciplinary storytelling workshops	Community members and local stakeholders in seven UK catchments	United Kingdom	Public engagement, decision-making in drought risk management	Analysis of workshop outcomes, qualitative analysis of storyboarding sessions	Enhance resilience and adaptability in drought risk management through creative participatory methodologies
Sparre & Boje (2020)	Participative Action Research (PAR) workshops	24 total: 18 farmers & 6 consultants (independent farmers and farmer-researchers from Seges)	Denmark	Changes in behaviour and perceptions, new sustainability narratives	Qualitative analysis of discussions, participant feedback surveys	Create new perceptions about sustainability among farmers
Krepelková et al. (2019)	Qualitative study with focus groups and interviews	60 total: 52 students, 8 teachers (students average age 8.55 years and female teachers from seven Czech elementary schools)	Czech Republic	Empowerment, competence in dealing with global issues	Focus groups, interviews, open-coding analysis	Examine the impact of the Global Storylines (GSL) program on empowerment and competence
McNaughton (2013)	Qualitative research; Action research	Pupils aged 6-11, 16 teachers: 8 level 1	Glasgow, Scotland	Effectiveness in ESD and GCE	Analysis of portfolios, observations,	Explore the effectiveness of educational drama

teachers, 8 level 2
teachers

written and oral
responses,
reflective logs

within the Global
Storylines methodology

Table2. Intervention characteristics

Author (year)	Intervention Description	Delivery Method	Role of story	Adherence and Fidelity	Process Measures	Intervention Goal
Marks et al. (2023)	Co-created workshop to express and explore feelings and ideas about climate change	In-person workshops, interactive activities	Facilitate discussions, explorations of eco-emotions	Use of standardized workshop protocols, feedback loops to ensure fidelity	Engagement levels, thematic analysis of discussions	Foster a balanced emotional response and maintain hope while recognizing climate change challenges
Talgorn & Ullerup (2023)	Participatory workshops focusing on storytelling, persona creation, and group discussions	Varied formats and durations, online and in-person	Shift perspectives: human-centred to planet-centred	Adherence to workshop structure, facilitator training	Analysis of participant feedback, engagement levels during workshops	Enhance critical thinking and creativity related to sustainability themes
Arief et al. (2022)	"Bio-based Experiential Learning" program focusing on urban farming and	Workshops, hands-on activities, video storytelling	Educating elementary school students	Monitoring of participation, standardized activity protocols	Engagement in activities, qualitative feedback	Enhance awareness and practices related to urban farming and environmental stewardship

	environmental stewardship				from participants	
Donovan (2016)	Co-design visual narratives with children to express views on consumption and sustainability	In-person workshops, creative activities	Express views on consumption, sustainability through visual narratives	Standardized workshop procedures, facilitator training	Engagement in narrative creation, qualitative feedback	Encourage critical engagement with sustainable consumption
Liguori et al. (2021)	Creative participatory methodologies integrating drought science and community storytelling	Workshops, interdisciplinary activities	Conceptualize, communicate complex ideas about drought and water management	Standardized session plans, feedback mechanisms	Engagement levels, thematic analysis of discussions	Integrate local knowledge with scientific modelling for drought risk management
Sparre & Boje (2020)	PAR workshops with conversational storytelling sessions	In-person workshops, group work	Create new intersubjective perceptions; facilitated discussions	Structured workshop protocols, iterative feedback loops	Engagement levels, narrative content analysis	Develop new sustainability narratives for Danish agriculture
Krepelková et al. (2019)	Global Storylines (GSL) program focusing on global issues and empowerment	In-person workshops, role-playing activities	Empower students and teachers through dramatization (global issues)	Standardized GSL protocols, regular monitoring	Engagement in activities, qualitative feedback	Enhance empowerment and competence in dealing with global issues

McNaughton (2013)	Educational drama within the Global Storylines methodology	In-person drama sessions, reflective activities	Explore and act out global issues	Use of Global Storylines frameworks, reflective practice	Engagement in drama activities, qualitative analysis of reflections	Enhance education for sustainable development (ESD) and global citizenship education (GCE)
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1. Stories of Hope Created Together: A Pilot, School-Based Workshop (Marks et al., 2023)

Population Characteristics

The study by Marks et al. (2023) involved six pupils aged 16-18 from a state school in the Southwest of the UK, chosen due to their critical developmental stage. Adolescents in the final years of secondary education are at a pivotal phase for identity formation and worldview development. They are ideal participants for influencing attitudes and behaviours regarding climate change. The focus was on addressing eco-emotions among youth, with collaborators aged 19-25 who had experienced distressing eco-emotions themselves. This setting within a school provided a structured environment conducive to emotional support and peer interactions, essential for processing eco-emotions and fostering a sense of realistic, active hope through storytelling and future envisioning.

Intervention and Study Design

Marks et al. (2023) employed the Youth Participatory Action Research (YPAR) framework, involving young people as active contributors. The workshop was developed through a collaborative process with youth collaborators, researchers, educators, and clinicians in four 2-hour meetings over three months, ensuring continuous refinement. The three-hour workshop included four parts: group building and support, emotional engagement through personal reflections and videos, fostering hope through guided visualization and creative expression, and sharing stories of hope. A unique feature was a live illustrator creating real-time visual representations, enhancing understanding and retention. Data collection included audio recordings, thematic analysis, sentiment analysis, and follow-up surveys at one and four weeks post-workshop.

Effectiveness and Feasibility

Thematic analysis of workshop transcripts revealed four major themes: a multidimensional understanding of climate change, painful emotions, positive aspects of climate change bringing people together, and hope for the future (Marks et al., 2023). Sentiment analysis showed a prevalence of positive emotions over negative ones, indicating a balanced emotional response fostering hope. Follow-up surveys confirmed the workshop's lasting positive impact,

with participants reporting increased emotional awareness and motivation to discuss climate issues. The collaborative development process and the familiar school setting supported the feasibility, which provided a practical and supportive environment. Despite some logistical challenges, the study demonstrated the workshop's practicality and effectiveness in various educational contexts (Marks et al., 2023).

2. Invoking 'Empathy for the Planet' through Participatory Ecological Storytelling (Talgorn & Ullerup, 2023)

Population Characteristics

Talgorn and Ullerup (2023) included a diverse group of participants: design students, business stakeholders and professional designers. The first group comprised 31 first-year industrial design students from a Dutch university who participated in an online workshop in January 2022. The second group included 10 participants, professional designers and senior students, who attended an in-person workshop during an international design conference in July 2022. The third group involved 50 participants from a large multinational company, divided into two workshops held in February 2023, with individuals from the marketing, business, design, and innovation sectors. This diversity ensured comprehensive insights into how different groups perceive and interact with the concept of empathy for the Planet.

Intervention and Study Design

The study used workshops to engage participants in creating stories from human and nonhuman perspectives, addressing gaps in sustainability practices. Participants were introduced to storytelling theory, covering narrative transportation, empathy, mental imagery, and story structures. They then developed detailed personas, including nonhuman entities, to foster a holistic, planet-centred view. Using a structured template, participants created and shared their narratives, fostering a collaborative environment. The interdisciplinary team aimed to engage participants profoundly and personally with environmental themes, promoting empathy for all elements of the Planet.

Effectiveness and Feasibility

Talgorn and Ullerup (2023) assessed the intervention's effectiveness through thematic analysis of stories, feedback questionnaires, and sentiment analysis. Participants reported

significant emotional connections with their nonhuman characters, describing the experience as transformative. Stories frequently depicted vivid, emotionally charged environmental scenarios, fostering empathy. Sentiment analysis revealed a mix of emotions, reflecting the workshops' complexity. The method proved adaptable across different groups, with participants reporting increased environmental awareness and a sense of responsibility. The structured yet flexible format facilitated meaningful storytelling, fostering community and collective environmental action. Future studies could further refine and expand this method to enhance its impact.

3. Sustainability Communication through Bio-Based Experiential Learning (Arief et al., 2022)

Population Characteristics

Arief et al. (2022) targeted 3rd to 5th graders, an age group receptive to new ideas and behaviours, aiming to shape long-term attitudes towards environmental sustainability. The study involved 74 children, with 20 participating in the first workshop and 54 in the second session. Additionally, 20 parents participated, acknowledging the role families play in reinforcing behaviours. The study was conducted in Bandung, a densely populated urban area, emphasizing the need to address environmental issues in urban settings. The urban context provided a relevant backdrop for discussing challenges of urban agriculture and sustainable living.

Intervention and Study Design

The study employed a bio-based experiential learning approach combined with participatory action research (PAR) and storytelling to foster environmental awareness among elementary school students. The design was structured in four stages:

Planting Challenge Workshop, conducted on January 31, 2021, engaging 20 children and five biology teachers. Planting kits were sent to participants, and storytelling sessions introduced natural phenomena and sustainability. Children decorated planting kits and created three to five minute videos documenting the process, which were analysed and shared on social media.

Kid's Green Games Workshop: Conducted on February 6, 2021, involving 20 children sharing their bio-based learning experiences with an audience of 74 children, 20 parents, and teachers. This stage included presentations on environmental threats, interactive games, and a review of the children's videos.

Qualitative and Quantitative Analyses: Conducted on February 6, 2021, including

surveys, interviews, and observations to evaluate the program's impact. Parents were surveyed on their satisfaction with their children's implementation of learned behaviours, awareness, and knowledge. Qualitative data from semi-structured interviews were analysed for common themes.

The study's design integrated PAR, storytelling, and bio-based experiential learning to deeply engage students and their families in environmental education.

Effectiveness and Feasibility

Effectiveness was evaluated using qualitative and quantitative methods. Surveys and questionnaires assessed various impacts, including overall perception, bio-based learning impact, communication impact, and storytelling impact. Observations during workshops assessed children's engagement and response to educational activities.

The results showed high levels of engagement and practical application of concepts taught. For instance, 87% of parents agreed that their children implemented environmental practices learned during the program in their daily lives. Additionally, 91% of parents observed an increase in their children's creativity in communication. Regarding communication impact, 84% of parents noted significant improvement in their children's communication skills about environmental issues. Storytelling was particularly effective, with 75% of parents indicating that their children applied this method in their interactions. The storytelling impact extended to knowledge and awareness, with 84% agreeing that the program raised environmental awareness and 71% agreeing that it increased their knowledge.

Feasibility was demonstrated through the collaborative approach of the PAR methodology, facilitating active participation from various stakeholders, including parents, teachers, and students. This approach highlighted the program's potential for scalability and replicability in other urban areas and schools.

4. How Children Represent Sustainable Consumption Through Participatory Action Research (Donovan, 2016)

Population Characteristics

The study involved sixty primary school students, aged 11 to 13, from an urban Australian public school in Adelaide. The school had a diverse socio-educational background and followed the Australian Curriculum and the International Baccalaureate Primary Years Program, emphasizing independent learning and transdisciplinary themes. This age group was selected

because children at this stage are forming consumption habits and retain creativity, essential for participatory action research (PAR) and co-design methods.

Intervention and Study Design

The study employed a PAR approach over 14 weeks, with weekly 80-minute sessions. It used the UK Design Council's Ten Step Guide and The Story of Stuff to simplify concepts related to production and consumption cycles. Students were divided into mixed-gender groups, working on stop-motion animation or illustrated printed books. They listed recent family purchases, identified necessities, and created mind maps to explore production and consumption. Using these insights, they developed characters and narratives about sustainable consumption, creating ten stop-motion animations and five illustrated books. The structured yet flexible schedule allowed for continuous feedback and adjustments, ensuring responsiveness to participants' needs.

Effectiveness and Feasibility

Effectiveness was measured through observational field notes, group discussions, thematic analysis of artefacts, and documentation. Observational notes captured real-time interactions and behaviours, while group discussions fostered deeper understanding. The thematic analysis identified common themes in the children's narratives, and the documentation provided a visual record of activities. The study successfully engaged children in discussions about sustainable consumption, fostering creativity and critical thinking. The children's ability to conceptualize and communicate sustainability ideas was demonstrated through their animations and books. The study fostered a collaborative learning environment, though challenges included time constraints and the initial non-involvement of students in planning, which might have limited their sense of ownership. Despite these challenges, the study effectively promoted sustainable consumption awareness among young learners, with feasibility depending on resource availability and curriculum flexibility.

5. Towards "Creative Participatory Science": Exploring Future Scenarios (Liguori et al., 2021)

Population characteristics

The study engaged local communities from various catchment areas in the UK, including the Bristol Frome, Eden, Dyfi, and Tamar catchments. Each area represented diverse geographical and socio-economic contexts to ensure a comprehensive understanding of drought impacts. Participants included residents, farmers, policymakers, and water managers, chosen for their lived experiences and local knowledge concerning water usage, drought impacts, and environmental management. This diversity aimed to capture the varied impacts of drought across different regions and communities. Integrating local knowledge into scientific research aimed to enhance community resilience and develop effective and sustainable responses to drought, providing relevant recommendations for policy and practice.

Intervention and Study Design

The study utilized a multi-faceted design integrating specialist drought science with community storytelling. The research was conducted through multiple stages, including six Local Advisory Group (LAG) meetings for continuous refinement and participant feedback. Community engagement activities such as public storytelling events, farm visits, excursions to nature reserves, and photography workshops captured a wide range of community views on local water dilemmas. Storyboarding workshops helped participants visualize and develop narratives about future drought scenarios, combining scientific modelling with arts and humanities approaches. The iterative "scenario-ing" process involved qualitative scenario development and participatory methods, encouraging participants to explore and envision alternative futures grounded in both scientific rigour and local relevance.

Effectiveness and Feasibility

The study used qualitative and participatory methods to evaluate effectiveness and feasibility. Observational field notes, group discussions, and thematic analysis of creative outputs provided comprehensive data on participant engagement and dynamics. The participatory methods captured the complexity of community engagement and the integration of scientific and local knowledge. Participants showed high engagement, with the inclusive approach maintaining interest and participation. The integration of local knowledge ensured relevant drought scenarios. The creative outputs demonstrated participants' ability to conceptualize and communicate complex drought and water management ideas. The study's flexible design allowed adjustments based on feedback, though challenges included limited project duration and the need for specific

materials, which could limit replication. Despite these challenges, the study effectively engaged communities, fostered critical thinking, and informed policy and practice with relevant outcomes. Multiple data sources and triangulation enhanced the validity of the findings.

6. Utilizing Participative Action Research with Storytelling Interventions (Sparre & Boje, 2020)

Population characteristics

The study involved 35 farmers from various regions of Denmark, including both conventional and organic practitioners. This diversity aimed to capture regional differences in farming practices and sustainability challenges. Participants ranged from small family farms to larger commercial operations, ensuring a broad perspective on agricultural practices. The inclusion of farmers involved in crop and livestock farming ensured the findings were relevant to multiple agricultural sectors. This diverse group provided invaluable insights into sustainable practices, fostering a comprehensive understanding essential for developing adaptable sustainability strategies.

Intervention and Study Design

Sparre and Boje employed Participatory Action Research (PAR) and storytelling methodologies to explore sustainable farming practices. The design included workshops with farmers and researchers from Seges. The PAR approach created a collaborative environment for sharing experiences and insights. The first workshop covered topics like social and environmental symbiosis, Danish agriculture status, future farming, and customer behaviour. Participants engaged in a three-phase future workshop concept: criticism, utopia, and realization phases. Subsequent workshops involved critical discussions, imaginative exercises, and practical planning. Reflective sessions evaluated progress and gathered feedback, allowing continuous refinement. This design maximized participant engagement and co-creation of knowledge, blending theory and practice to develop practical, context-specific solutions for sustainable farming.

Effectiveness and Feasibility

The study used observational field notes, group discussions, and thematic analysis of creative outputs like storyboards to capture the dynamic and participatory nature of the research.

The structured yet flexible design of the workshops allowed for adaptability based on participant feedback. Challenges included inadequate initial onboarding and participants' adaptation to the role of knowledge creators. Despite these challenges, the study demonstrated that with proper support and clear communication, the PAR approach could be feasibly implemented. Researchers' roles as facilitators maintained engagement and fostered a collaborative environment. The project succeeded in creating new narratives about sustainable farming, providing a more nuanced and inclusive understanding of sustainability. The involvement of proactive farmers sustained momentum and ensured the relevance of discussions and outputs. The study's outcomes suggest that with careful planning and adequate support, the PAR approach can engage stakeholders in research and generate innovative solutions to sustainability issues in agriculture.

7. Becoming a Global Citizen through Participation in GLP (Krepelková et al., 2019)

Population Characteristics

The study "Becoming a Global Citizen through Participation in the Global Storylines Program" examined the impact of the GSL educational program on primary school students and teachers in seven Czech elementary schools during the 2017/2018 school year. The program involved 52 students, aged approximately 8.55 years, and eight female teachers. The program aimed to increase sustainability competencies and awareness of global problems among students through participative, project-based, and experiential learning. This age group was chosen because they are beginning to form a basic awareness of global issues, making it a critical period for interventions. Teachers were included to assess the program's feasibility and effectiveness.

Intervention and Study Design

The GSL program integrates drama and storytelling as core educational methods to engage students in role-playing and project-based learning on real-world issues like immigration, resource depletion, and water scarcity. This approach makes abstract global issues more tangible and relatable, enhancing students' understanding and empathy. The program's impact was evaluated through seven interviews with eight female teachers and focus groups with students, providing insights into experiences, emotional responses, perceived empowerment, and challenges. The design aimed to foster critical thinking and empathy through dramatization,

allowing students to explore sustainability and other global issues creatively. Scenarios were created to address these challenges, enabling students to develop practical solutions through their stories.

Effectiveness and Feasibility

The GSL program's effectiveness was assessed through qualitative methods, including focus groups with students and interviews with teachers. Students enjoyed the GSL project, showing increased engagement and activity in other lessons as well. Teachers observed increased student empowerment, particularly during voting activities where they could influence the storyline. However, constraints included storylines being too simplistic for older students or too complex for younger ones, and social dynamics sometimes overshadowing the issues. Some students felt manipulated by teachers steering the story. Teachers reported benefits such as broader global awareness and improved teaching skills, though reflection sessions were challenging and required more skill development. The feasibility of the GSL program was supported by its structured yet flexible design, allowing for adjustments based on feedback. However, significant preparation time and resource needs posed challenges.

8. From Acting to Action: Developing Citizenship through GLD (McNaughton)

Population Characteristics

The study "From Acting to Action: Developing Global Citizenship Through Global Storylines Drama" involved teachers and students from 28 primary and secondary schools in Glasgow. Data were collected from 16 teachers across eight schools in the first year, with teaching experience ranging from five to over 20 years. These teachers, all volunteers, received training in action research methodology, Education for Sustainable Development (ESD), Global Citizenship Education (GCE), the Storyline approach, and using educational drama as a learning medium. This diverse teacher population provided a comprehensive view of the program's effectiveness across different educational contexts and helped assess the scalability and adaptability of the GSL approach. Glasgow's diverse population and various social and environmental challenges provided a relevant setting for exploring global citizenship issues and integrating the GSL program into existing curricula.

Intervention and Study Design

The study utilized a qualitative research design, focusing on participatory action research (PAR) to assess the implementation and impact of the GSL program. This design engaged teachers as co-researchers, emphasizing their active participation in both implementation and evaluation. Participating teachers underwent comprehensive training to equip them with the skills needed to implement the GSL program and conduct action research in their classrooms. Teachers then implemented the program, involving students in creating and acting out stories addressing global citizenship themes like sustainability, equity, and justice. Data collection included reflective journals, lesson plans, student work, and audio/video recordings, providing rich qualitative insights. Regular reflective practice sessions allowed teachers to discuss their experiences and challenges, fostering a collaborative learning environment and enabling real-time refinement of the program. Thematic analysis identified common patterns and themes related to the program's effectiveness and impact on students' global citizenship competencies and teachers' pedagogical practices.

Effectiveness and Feasibility

The study employed qualitative measurements to assess the GSL program's effectiveness and feasibility. Reflective journals, lesson plans, student work, and audio/video recordings were analysed thematically. The program significantly enhanced students' understanding of global issues like sustainability, equity, and justice through interactive storytelling activities, increasing empathy, critical thinking, and collaboration skills. Teachers reported positive impacts on their teaching practices, developing new pedagogical skills in using drama and storytelling and gaining confidence in integrating complex global issues into their curricula. Reflective practice sessions were crucial for continuous improvement and sharing best practices. The program's flexibility allowed it to be integrated into various subjects and adjusted to fit students' needs and interests. However, challenges included the time-intensive nature of training and implementation. Despite these challenges, feedback was positive, with teachers believing in the program's value and potential for long-term impact. The study provided robust evidence of the GSL program's effectiveness in developing global citizenship competencies among students and enhancing teachers' pedagogical practices, highlighting its adaptability and comprehensive training as key factors in its success.

Comparative analysis

Process Measures vs. Outcome Measures

Most studies used participatory and interactive methods to engage participants actively, including structured workshops, storytelling sessions, and creative exercises. Marks et al. (2023) employed a holistic workshop using the Youth Participatory Action Research framework, while Talgorn and Ullerup (2023) utilized ecological storytelling workshops. Arief et al. (2022) integrated bio-based experiential learning with storytelling and participatory action research methods. Donovan (2016) used co-design workshops to represent sustainable consumption, and Liguori et al. (2021) involved Local Advisory Group (LAG) meetings and community storytelling events. Sparre and Boje (2020) employed PAR workshops and storytelling interventions, while Krepelková et al. (2019) and McNaughton (2013) used drama and role-playing within educational programs. Outcome measures generally focused on emotional and cognitive impacts. Marks et al. (2023) assessed emotional awareness, hopefulness, and motivation to discuss climate issues. Talgorn and Ullerup (2023) evaluated emotional connections and empathy through thematic analysis of participant-created stories. Arief et al. (2022) measured environmental practices adopted by children and their improved communication skills. Donovan (2016) assessed understanding of sustainable consumption and creativity in communication. Liguori et al. (2021) evaluated community understanding of drought risks and integration of local knowledge. Sparre and Boje (2020) measured new perceptions about sustainability, while Krepelková et al. (2019) and McNaughton (2013) focused on student engagement, empowerment, and global awareness. Most studies used a combination of qualitative and quantitative tools to measure the impact of their interventions. Marks et al. (2023) employed follow-up surveys to gauge emotional awareness and motivation. Talgorn and Ullerup (2023) used participant feedback questionnaires to assess empathy and emotional connections. Arief et al. (2022) conducted surveys and semi-structured interviews to evaluate environmental practices and communication skills. Donovan (2016) used observational field notes and thematic analysis. Liguori et al. (2021) applied group discussions and thematic analysis of creative outputs. Sparre and Boje (2020) relied on observational field notes, group discussions, and thematic analysis, while Krepelková et al. (2019) used focus groups and interviews, and McNaughton (2013) used reflective journals, lesson plans, and audio/video recordings.

Sample Sizes and Populations

The studies reviewed exhibited a range of sample sizes, from small groups of six participants (Marks et al.) to larger cohorts involving 74 children and their parents (Arief et al., 2022). This variation in sample size reflects the diverse methodological approaches and contexts in which the interventions were applied. The targeted populations included a wide spectrum: school pupils, design students, professional designers, business stakeholders, farmers, and local community members. For instance, Marks et al. and Arief et al. (2022) concentrated on younger populations with the goal of instilling long-term behavioural changes, recognizing the importance of early engagement in shaping lifelong environmental attitudes. Conversely, Sparre & Boje and the study titled Towards ‘Creative Participatory Science’ focused on adult populations, fostering immediate sustainable practices and resilience within their communities. Krepelkova and McNaughton's inclusion of primary and secondary school students and teachers highlights the significance of embedding sustainability education at multiple levels within the schooling system.

Each population presents distinct needs, requiring tailored interventions to maximize receptivity and effectiveness. This underscores the importance of future research analysing how interventions can be adapted to suit different groups, ultimately guiding the development of more effective, context-specific sustainability workshops (Baker et al., 2015).

Targeting Emotional Responses

Engaging participants emotionally was a central focus across nearly all of the studies, utilizing tailored methods. Marks et al. addressed eco-emotions like anxiety and grief through group discussions and visual storytelling, while Talgorn fostered empathy by using narratives from nonhuman perspectives. Arief et al. (2022) combined storytelling with hands-on activities, creating a dynamic learning environment for children and parents.

The study on sustainable consumption used co-design and narrative creation to help children articulate their understanding of sustainability. Towards ‘Creative Participatory Science’ merged local and scientific knowledge through community storytelling, enhancing its relevance. Sparre & Boje employed storytelling to deepen engagement, while Krepelkova and McNaughton used drama and role-playing for a more immersive experience.

A central consideration was to measure emotional responses, as emotions significantly influence daily behaviours. Understanding participants’ emotional engagement with

sustainability themes allows designers to identify which emotions, such as empathy or hope, are most effective in promoting behavioural change, providing insights for future interventions (Schneider & Linden, 2023).

Main Outcomes and Patterns

Across the studies, several common outcomes were observed, including increased emotional awareness, enhanced empathy, adoption of sustainable practices, and improved communication skills. For instance, Marks et al. (2023) reported heightened emotional awareness and hope, demonstrating the effectiveness of storytelling in reducing eco-anxiety and fostering positive environmental engagement. Similarly, Talgorn and Ullerup (2023) found that participants developed greater empathy towards nonhuman entities, a key factor in promoting broader environmental consciousness. A significant trend in the interventions was the promotion of practical environmental actions. Arief et al. (2022) found that combining storytelling with joint family activities improved communication and fostered collective environmental responsibility. Similarly, the study on sustainable consumption revealed that children gained a deeper understanding of the concept, suggesting that storytelling can effectively nurture informed and responsible future consumers. Liguori et al. (2021) demonstrated how the 'Creative Participatory Science' study enhanced community resilience to drought risks, highlighting the role of storytelling in preparing communities for environmental challenges. Additionally, Sparre & Boje (2020) observed the creation of new sustainability narratives and collective understanding among participants, while Krepelkova and McNaughton (2019) reported increased student engagement and global awareness, underscoring the educational benefits of storytelling.

These recurring patterns suggest a broader trend where storytelling interventions not only enhance emotional and cognitive engagement but also support the adoption of sustainable behaviours. The consistency of these outcomes across diverse contexts and populations indicates potential areas for further investigation, where future research could explore how these patterns might be adapted and optimized for different demographic groups and settings (Whitesell, 2018).

Types of Analysis

While thematic analysis was common, each study applied it differently based on their specific data and objectives. Marks et al. used thematic analysis to identify key themes in workshop discussions and participant feedback, complemented by sentiment analysis to quantify emotional responses. Talgorn conducted thematic analysis on participant-created stories to

uncover themes like human/nature antagonism, integrating sentiment analysis for emotional impact. Arief et al. (2022) combined thematic analysis of interview data with quantitative survey results. Donovan (2016) utilized thematic analysis of students' creative outputs to understand how children represent sustainable consumption. Liguori et al. (2021) applied thematic analysis to community-created storyboards and narratives, focusing on drought scenarios in "Towards Creative Participatory Science." Sparre and Boje (2020) performed thematic analysis on discussions and new narratives about sustainable farming. Křepelková et al. (2019) used thematic analysis of focus groups and teacher interviews, while McNaughton (2013) employed thematic analysis of reflective journals and lesson plans.

Data Collection and Intervention Methods

Data collection methods included audio recordings, surveys, thematic and sentiment analyses, and direct observations. Marks et al. (2023) recorded workshop sessions and conducted follow-up surveys. Talgorn and Ullerup (2023) collected participant feedback through questionnaires and analysed storytelling sessions. Arief et al. (2022) used surveys, interviews, and observations during workshops. Petrilli et al. (2022) in their study on how children represent sustainable consumption collected observational notes and video recordings. Liguori et al. (2021) in the 'Creative Participatory Science' study integrated observational notes from LAG meetings and community storytelling events. Sparre and Boje (2020) relied on detailed observational notes and group discussions. Křepelková et al. (2019) gathered data through focus groups with students and interviews with teachers. McNaughton (2012) collected reflective journals, lesson plans, and recordings.

Diverse Approaches to Sustainability Education Through Storytelling

The studies reviewed encompass a wide range of themes, reflecting the multifaceted nature of sustainability education. Marks et al. (2023) and Arief et al. (2022) focus on climate change education, targeting younger populations to instill sustainable behaviours early on. These studies emphasise the significance of early educational interventions in shaping long-term environmental consciousness. In contrast, Sparre and Boje (2020) and the study titled "Towards Creative Participatory Science" by Liguori et al. (2021) concentrate on community resilience and sustainable farming, highlighting the critical role of local communities and agricultural practices in fostering sustainability. By engaging farmers in participatory action research, these studies demonstrate how collective storytelling can shift perceptions and practices towards more

sustainable farming methods. The study by Donovan (2016) explores the theme of sustainable consumption, focusing on how children can use visual narratives to advocate for eco-friendly behaviours. This study underscores the potential of involving younger generations in sustainability efforts through creative and participatory approaches. Additionally, Krepelková et al. (2019) and McNaughton (2013) address global citizenship and sustainability competences through educational drama and project-based learning, illustrating how immersive and interactive educational methods can enhance students' understanding and commitment to global sustainability issues. Each of these studies, while diverse in their thematic focus, contributes to a broader understanding of how storytelling and participatory methods can be effectively utilised to promote sustainable behaviours.

Limitations of the Reviewed Studies

The studies reviewed highlighted several common and unique challenges. A recurring limitation was the time-intensive nature of training and implementation phases (McNaughton, 2013) and the need for adequate resources and support, particularly in teacher training (Krepelkova et al., 2019). Additionally, participant onboarding was sometimes inadequate, leading to dropouts (Sparre & Boje, 2020). The complexity of certain storylines posed difficulties for younger participants (Krepelkova et al., 2019), and classroom social dynamics often overshadowed the focus on global issues (McNaughton, 2013). Many studies faced limitations related to the short duration of interventions and small sample sizes, impacting the ability to measure long-term behavioural changes. For instance, Marks et al. (2023) found that while their workshop increased emotional awareness, the short duration may not sustain long-term effects. Similarly, Talgorn and Ullerup (2023) struggled to measure the long-term impacts of ecological storytelling due to their study's brief nature. Variability in participant engagement and consistency was another common issue. Arief et al. (2022) noted challenges in maintaining consistent experiential learning activities. This issue was echoed in Liguori et al.'s (2021) study, which faced participation inconsistencies affecting overall engagement. The subjective nature of thematic analysis posed limitations in several studies. Donovan (2016) and Sparre and Boje (2020) highlighted the challenges of ensuring consistent and reproducible findings. Additionally, the complexity of storylines in drama-based interventions by Krepelkova et al. (2019) and McNaughton (2013) often posed barriers for younger participants and were affected by classroom dynamics. A critical limitation across many studies was the measurement of

intervention impacts only immediately post-intervention, lacking insights into long-term effects. This underscores the need for long-term studies with larger sample sizes and robust mixed-methods approaches to better understand the effectiveness of storytelling and PAR in promoting sustainable behaviours (Peterson et al., 2014 ; Howell, 2014).

Discussion

The results of this study provide a comprehensive scoping review of how storytelling and participatory action research (PAR) methods are utilized to promote sustainable behaviours across various populations and contexts. The studies reviewed underscore the potential of storytelling as a powerful tool to foster sustainable behaviours by engaging participants emotionally and cognitively, creating connections that can drive behaviour change. For example, Marks et al. (2023) found that their workshop significantly increased participants' emotional awareness and motivation to discuss climate issues, indicating that storytelling can foster a balanced emotional response and hope. This suggests that storytelling interventions can help individuals process complex emotions related to climate change and encourage proactive engagement. Similarly, Talgorn and Ullerup (2023) demonstrated that participatory ecological storytelling can evoke strong emotional connections to non-human characters, thereby enhancing empathy and environmental awareness. This emotional engagement is critical for fostering a sense of responsibility and action toward environmental issues. Arief et al. (2022) also highlighted that involving parents alongside children in storytelling activities can reinforce sustainable behaviours, suggesting that storytelling can effectively engage different age groups and foster family-based environmental education. The comparative analysis of the reviewed studies reveals key themes and patterns in how storytelling and PAR methods promote sustainable behaviours. Ebersbach and Brandenburger (2020) further contribute to this understanding by demonstrating that even short story-based interventions can enhance sustainable behaviour in children. Their study, which focused on children playing a fishing conflict game, revealed that children exposed to positive role models in a short story made more sustainable choices in resource management compared to those in the control group. This finding aligns with the concept of using role models in storytelling to influence pro-environmental behaviours. The studies addressed diverse themes, including climate change education, community resilience, sustainable consumption, sustainable farming, and global citizenship,

highlighting the versatility of storytelling and PAR methods. Using a mix of qualitative and quantitative methods such as surveys, interviews, thematic analyses, and participant feedback, these studies provided comprehensive insights into the emotional and cognitive impacts of the interventions. Involving a wide range of populations, from small groups to larger cohorts, the studies demonstrated the adaptability of storytelling interventions across different demographics. Key outcomes included increased emotional awareness, enhanced empathy, adoption of sustainable practices, and improved communication skills, showcasing the effectiveness of storytelling in fostering a deeper connection to sustainability issues and promoting proactive behaviours. Rizzi et al. (2019) also support these findings, showing that participatory storytelling activities can help foster pro-environmental attitudes in adolescents. Their study, which utilized role-play and co-design methods, revealed a significant increase in the emotional connection of adolescents with environmental sustainability issues, reinforcing the idea that emotional engagement is a crucial element in fostering sustainable behaviours.

The feasibility of storytelling interventions varies across different contexts. Studies such as Arief et al. (2022) and Sparre and Boje (2020) highlight the adaptability of structured, yet flexible workshop designs based on participant feedback. This adaptability is crucial for tailoring interventions to different educational settings and participant needs. The use of PAR methods, as seen in McNaughton (2013), allowed for continuous refinement of the intervention based on ongoing feedback, which is vital for maintaining relevance and engagement. These findings directly address the initial objectives of the review by demonstrating how storytelling and PAR methods can effectively promote sustainable behaviours across diverse populations and contexts.

Limitations

This scoping review encountered several limitations that should be acknowledged. One significant limitation was the language barrier, which led to the exclusion of potentially relevant articles not available in English. This might have resulted in a narrower perspective and missed insights from non-English-speaking researchers (Rockliffe, 2021). The lack of open access to many articles also posed a challenge. Significant time was spent searching for accessible literature, which could have otherwise been utilized for a deeper analysis (Pearce, 2018). This limitation underscores the need for better access to academic resources to facilitate

comprehensive reviews. Additionally, the scope of this review was constrained by conducting the analysis at an observer level rather than an in-depth analytical level. Given the novelty of the topic, an observer-level approach was deemed necessary; however, this might not capture the full complexity and nuances of the interventions studied (Mueller et al., 2018). Furthermore, the review was carried out by a single researcher, which introduces the possibility of subjective bias in the selection and interpretation of studies. The lack of a research team might have led to an incomplete consideration of all relevant literature and potential oversight of critical studies (Haddaway, 2015). The diversity of the included studies presented another challenge, making direct comparisons difficult. The heterogeneity in study designs, populations, and outcomes measured limited the ability to perform a cohesive comparative analysis. Additionally, the use of the Covidence software, while beneficial for managing the review process, had limitations. The absence of a separate abstract and title screening phase may have impacted the thoroughness of the initial screening (Menzies, 2011). Finally, the exclusion of grey literature is a significant limitation. Grey literature, which includes reports, theses, and non-peer-reviewed articles, often provides valuable insights and practical perspectives that are not captured in peer-reviewed journals. Excluding this literature may lead to publication bias, limiting the comprehensiveness of the review (Godin et al., 2015).

Strengths

This scoping review exhibits several strengths that enhance its contribution to the field of sustainability education. Firstly, the comprehensive scope of the review, which encompasses a diverse range of themes such as climate change education, community resilience, sustainable consumption, and sustainable farming, underscores the versatility and broad applicability of storytelling and participatory action research methods. The rigorous methodological approach, adhering to PRISMA guidelines, ensures the reliability and validity of the findings (Tricco et al., 2018). The inclusion of both qualitative and quantitative data collection methods, such as surveys, interviews, thematic analyses, and participant feedback, provides a rich, multidimensional understanding of the emotional and cognitive impacts of the interventions. This mixed-methods approach enables a thorough exploration of how storytelling can foster sustainable behaviours across various contexts. Furthermore, the review's focus on diverse populations, from young children to adults, highlights the adaptability of storytelling

interventions. This inclusivity enhances the relevance of the findings to different demographic groups, making the results more generalizable. The iterative search strategy and systematic identification and analysis of relevant studies contribute to the robustness of the review. By providing a detailed examination of existing research, this study lays a solid foundation for future investigations and practical applications in promoting sustainable behaviours through storytelling.

Practical Implications

The practical implications of this research are significant for policymakers, educators, and practitioners. Comprehensive training programs should equip educators and facilitators with the necessary skills to deliver storytelling interventions effectively. Adequate resources and support must be provided to ensure successful implementation. Clear communication about program demands and benefits can enhance participant engagement and reduce dropout rates. Integrating storytelling and PAR methods into educational curricula can enhance their scalability and sustainability. Aligning these methods with educational standards will facilitate their adoption and maximize their impact. Tailoring storylines to match the age and cognitive abilities of participants is essential for maintaining engagement and comprehension. Encouraging local community involvement ensures cultural relevance and increases the effectiveness of interventions. Robust evaluation systems can help continuously improve these programs, ensuring they meet educational goals effectively. Forming partnerships between educational institutions and other organizations can enhance the reach and effectiveness of storytelling initiatives.

Recommendations for Future Research

Future research should focus on several areas to enhance the effectiveness and scalability of storytelling interventions for promoting sustainable behaviours. Firstly, comprehensive training programs should be developed for educators and facilitators to ensure they are well-prepared to implement storytelling interventions effectively. This training should include strategies for managing classroom dynamics and engaging diverse groups of participants (Krepelková et al., 2019). Ensuring that sufficient resources are available for the preparation and execution of these programs, including materials for storytelling and animation, is also crucial. Providing adequate support for teachers and facilitators is essential for the successful implementation of these interventions (Moir, 2018).

Improving the initial onboarding process is another key area. Clearly communicating the nature and demands of the program can reduce dropout rates by ensuring participants understand the commitment required and the potential benefits (Grabarczyk et al., 2022). Tailoring storylines to match the age and cognitive abilities of participants will help maintain interest and facilitate understanding. Developing age-appropriate materials is essential to engage participants effectively (Lewa et al., 2023 ; Petrilli et al., 2022).

Moreover, conducting longitudinal studies to assess the long-term impacts of storytelling interventions on sustainable behaviour is important. Currently, it is unknown how long-lasting the effects of these interventions are. Therefore, further investigation is needed to determine the duration of their impacts, which can inform the development of follow-up interventions or additional support mechanisms (Peterson et al., 2014). These studies can provide a more comprehensive understanding of the effectiveness of storytelling interventions by tracking behavioural changes over time and determining their lasting impact (Howell, 2014).

Extending research to new populations beyond students and farmers is essential. Investigating how storytelling interventions can be applied in other contexts related to environmental sustainability—such as among corporate and business leaders, healthcare professionals, and workers in the tourism sector—could yield valuable insights and further validate the effectiveness of these methods across diverse groups (Cisneros, 2023). Lastly, exploring ways to integrate storytelling and participatory action research (PAR) methods into existing curricula can ensure these interventions are scalable and sustainable (Williamson et al., 2022). Aligning these methods with educational standards can enhance their adoption and impact (Furu et al., 2021). This broader approach can contribute to the development of sustainable practices and environmental awareness across various educational and community settings (Hofman-Bergholm, 2022).

Conclusion

The studies reviewed in this thesis highlight the significant potential of storytelling and PAR in promoting sustainable behaviours. These methods effectively engage participants emotionally and cognitively, fostering a deeper connection to sustainability issues. This review addresses the research questions by demonstrating how storytelling and PAR can be used to promote sustainable behaviours across diverse populations and contexts. Despite challenges such

as resource allocation, participant engagement, and the complexity of storylines for diverse age groups, the participatory nature of storytelling and PAR remains a major strength. These methods promote active engagement and personal relevance, crucial for the adoption of sustainable behaviours. The variability in study designs and participant demographics, while posing challenges for comparability and generalizability, also highlights the adaptability and broad applicability of these interventions. To advance this field, future research should focus on follow up studies to assess the long-term impacts of storytelling interventions, expanding research to include diverse populations, and implementing comprehensive training programs for educators and facilitators. Ensuring adequate resources and support, improving participant onboarding processes, and integrating storytelling and PAR methods into existing educational curricula are also crucial for the successful implementation and sustainability of these interventions. Overall, the reviewed studies underscore the promise of storytelling and PAR in fostering sustainable behaviours. By addressing the identified challenges and focusing on the recommended areas for future research, the effectiveness and scalability of these methods can be enhanced, promoting sustainability across diverse populations. This holistic approach has the potential to foster a deeper understanding and sustained commitment to sustainability, ultimately leading to more effective and widespread adoption of sustainable behaviours. Future research can build on these findings to develop more effective and scalable storytelling interventions, contributing to global environmental sustainability.

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Appendix

“During the preparation of this work, I used various AI tools to improve grammar, spelling, and academic writing style. Specifically, I used tools such as Grammarly, DeepL, OpenAI, Google Translate, and Consensus AI. Additionally, I used GPT-4 in combination with Consensus AI to include additional articles. These tools were employed to enhance readability and ensure that the text met academic standards. After using these tools, I thoroughly reviewed and edited the content as needed, taking full responsibility for the final outcome.”

PRISMA-Checklist

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page 4
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page 5-10
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page 9-11
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page 15-16
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Page 11-13
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Page 11-13
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page 16-18

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page 19-20
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 19-21
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Page 19-20
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page 21
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Page 19-21
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Page 22-26
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Page 40-41
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Page 27- 41
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Page 37-41
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 41-42
Limitations	20	Discuss the limitations of the scoping review process.	Page 42-43
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 45-46
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A

JBIG = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of

interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).