



Received: April 25, 2025
Reviewed: June 13, 2025
Accepted: June 20, 2025

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ARTICLE / ARTÍCULO

Rethinking Global Citizenship through Open Science. The Challenge of Game-Based Collaborative Research with Young People

Repensar la ciudadanía global desde la ciencia abierta. El desafío de co-investigar mediante el juego con personas jóvenes

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Abstract: A participatory research process framed within the open science paradigm was undertaken to explore how young people understand and engage with global citizenship in the context of the current severe socio-ecological crisis. Using a co-design methodology, the collaborative game *Global Quest* was conceived as both a citizen science research tool and an open educational resource. Inspired by ludo-pedagogical principles, it has been made available to education professionals to use when working on global citizenship themes. The game was test run on 15 occasions with approximately 400 participants, including both adolescents and professionals working in the socio-educational field. The game's tasks were refined with the help of qualitative observations collected using structured guides. This improved the balance between local and global themes, as well as between reflective and expressive activities. Analysis of the observed data revealed that the game encourages young people to express their perspectives on participation, diversity, sustainability, and rights. It also promotes critical reflection on global citizenship and fosters inclusive, collaborative dynamics. The process confirmed the significant potential of the game as both a pedagogical tool and a research tool. It is also suitable as a participation strategy for addressing social challenges creatively. Additionally, the materials for the game, the accompanying manual, and a didactic guide providing methodological guidelines for use in diverse educational contexts have been developed and shared openly.

Keywords: Global Education, Citizenship Education, Game Based Learning, Open Science, Participatory Research.

Resumen: Este artículo describe un proceso de investigación participativa enmarcado en el paradigma de ciencia abierta, para indagar cómo los jóvenes entienden y ejercen la ciudadanía global en el momento actual caracterizado por una grave crisis ecosocial. Mediante técnicas de codiseño se creó el juego colaborativo *Global Quest*, concebido simultáneamente como herramienta de investigación desde la ciencia ciudadana y como recurso didáctico abierto inspirado en la ludopedagogía, a disposición de los profesionales de la educación para trabajar temas de ciudadanía global. El dispositivo se puso en práctica en 15 ocasiones con aproximadamente 400 jugadores, adolescentes y profesionales de la intervención socioeducativa. Las observaciones cualitativas recogidas a través de diversas guías nos permitieron reelaborar las pruebas, introduciendo mejoras en el equilibrio entre lo local y lo global en las temáticas, así como entre pruebas reflexivas y expresivas. El análisis de las observaciones recogidas evidenció que el juego favorece la expresión de perspectivas juveniles sobre participación, diversidad, sostenibilidad y derechos, potencia la reflexión crítica sobre la ciudadanía global y genera dinámicas colaborativas inclusivas. Este proceso confirmó el potencial del juego como herramienta pedagógica y de investigación, así como su idoneidad como estrategia de participación para abordar problemas sociales de forma creativa. Se ha elaborado y compartido de forma abierta el material del juego, su manual y una guía didáctica que ofrece pautas metodológicas para aplicarlo en diversos contextos educativos.

Palabras clave: Educación Global, Educación para la ciudadanía, Aprendizaje basado en juegos, Ciencia abierta, Investigación participativa.

1. Introduction

As part of the «Building Global Citizenship with Young People»¹ and «Participatory Research in Global Citizenship Labs for Young People»² research and development projects, we developed a research and co-design strategy based on open science principles. These projects are a way of generating knowledge through participatory, collective, and open research with various stakeholders—primarily young people, but also teachers and other education professionals.

Our research began with a preliminary mapping of global citizenship initiatives in Asturias, Spain (Fueyo et al., 2023). This work was an attempt to understand how adolescents construct global citizenship. Here, global citizenship is defined as a form of citizenship that transcends nation-state belonging in favor of awareness of, and action in response to, the global challenges of today's eco-social polycrisis (Andreotti, 2021 & 2024; Prieto-Jiménez, 2020; Rodríguez-Izquierdo & García-Bayón, 2024; Stein, 2021).

This was achieved by adopting open science as both a participatory and democratic model of inquiry and a strategy to amplify the voices of young people throughout the research process (Abadal, 2021; Fecher & Friesike, 2014) and co-design phase (Design-Based Research Collective, 2003; Kleinsmann & Valkenburg, 2008; López et al., 2021). Unlike citizen science, which only involves citizens in data collection, this approach expands citizen involvement to encompass every stage of the research process. It fundamentally reshapes how research is conducted, who conducts it, and its purpose (Abadal, 2021; Escofet et al., 2021; Fecher & Friesike, 2014).

For us, engaging young citizens meant negotiating meanings, values, and expectations with a wide range of stakeholders. This approach challenged traditional knowledge hierarchies (Design-Based Research Collective, 2003) and questioned the institutional and political parameters that determine what constitutes valid knowledge. Ultimately, it challenged and redefined the traditional roles of both researchers and research subjects.

The methodological device was conceived as a bridge between knowledge and action, which enabled us to bring together theoretical and practical insights from a range of individuals in settings that extended beyond purely academic spaces. Consistent with previous studies (Calvo & Fueyo, 2025; Rodríguez-Hoyos et al., 2023), we rejected traditional research methods that focus on the knowledge held by researchers and its application to participants who tend to be viewed as passive objects lacking meaningful knowledge about the topic under investigation. For this reason, we chose to include groups that are often excluded from research—in this case, adolescents and young people—as active co-participants in the research process (Fueyo et al., 2024).

One of our methodological goals was to alter perceptions of young people in relation to global challenges. We aimed to provide a more positive and hopeful outlook than that typically projected by adult researchers onto this group. Our objective was to

¹ «La construcción de la ciudadanía global con personas jóvenes. Investigando prácticas transformadoras con metodologías participativas e inclusivas». PID2020-114478RB-C22 Proyecto financiado por MCIN/AEI /10.13039/501100011033.

² Investigación participativa en laboratorios juveniles de ciudadanía global. PID2023-146088OB-C32 Proyecto financiado por financiado por MICIU/AEI/10.13039/501100011033/ y por FEDER/UE.

position young people as key contributors to the various stages of the research process, starting with the design phase itself and the selection of data collection techniques.

Adopting an open science approach meant relinquishing the epistemological monopoly typically granted to researchers. This allowed for the incorporation of voices and experiences from the buffer zone between theory and practice. Despite the apparent novelty of this approach, it is important to note that many of its underlying principles are not entirely new to the field of education. The relationship between theory and practice, the necessity of researching from and with the perspectives of those at the heart of processes, and the pursuit of transformative, collaborative knowledge are all deeply rooted in the traditions of critical pedagogy and participatory action research.

These ways of thinking have been increasingly absent from conventional academic discourse lately. However, they resurface when the epistemological monopoly is disrupted and young people's voices are finally heard. Nevertheless, these approaches are not without controversy, particularly in relation to questions of validity, credibility, legitimacy, and bias. For example, it is argued that co-production may undermine the researcher's critical faculty, or that emotional involvement with participants may compromise objectivity and the generalizability of findings (Perry, 2022; Strasser et al., 2019).

Notwithstanding these arguments, we contend that the openness afforded by the combination of co-design and open science has enabled us to overcome pessimistic assumptions about the imaginations of young people, paving the way for more hopeful forms of action, the creation of open-access materials, and learning informed by situated dialogue. In our view, far from diminishing the depth of research, these methodologies have been instrumental in consolidating forms of inquiry that are more relational, ethical, and contextually relevant.

As Perry (2022) argues, co-production not only expands the field of knowledge but also redefines what constitutes valid knowledge within a framework of open, equitable, and democratic science. This approach goes beyond merely including a diverse range of voices. In our case, it pushes us to develop new ways of relating to young people and the institutions that support them, helping us build more sustainable relationships based on reciprocity and mutual recognition.

In this sense, our commitment to co-design and co-production through the lens of open science is as much an ethical and political stance as it is a methodological choice (Vallejo-Sierra et al., 2023). In today's context, it implies acknowledging that the potential for social transformation is not confined to predetermined or singular paths. This commitment led us, albeit unintentionally, to adopt a game-based approach to inquiry at the suggestion of the adolescents themselves.

Our decision to use games as a participatory and inclusive method of inquiry emerged from a session with a group of teenagers from the Los Glayus Association (2021)³ with whom we began holding workshops on global citizenship at the outset of our research project. Participants challenged traditional research methods by calling

³ <https://asociacionlosglayus.org/>

for new, more participatory, inclusive, and creative ways to explore what adolescents think and feel.

There is no doubt that games are a powerful educational tool. They allow children to safely explore their environment and learn the rules of social interaction without facing serious consequences (Whitaker, 2024). Educational research has shown that games positively influence key areas such as motivation, socialization, communication, self-expression, and engagement with the surrounding environment (Brown, 2010; Garrido-Sánchez & Crisol-Moya, 2023; Quiñones et al., 2025; Varas et al., 2023).

Collaborative games have enormous inclusive potential, allowing everyone to participate regardless of their diversity background, and create a space where emotions and rational thought can co-exist. These qualities are essential for addressing complex issues such as today's global challenges. Collaborative games can also be used as research tools (Gómez, 2015), as was the case in our study.

However, besides their potential as a tool for achieving instructional or competency-based objectives, we see games as an inspiring and creative activity. Rather than playing games to achieve a specific learning outcome, we emphasize the value of playing games for their own sake, placing the game itself front and center without predetermining the outcome.

According to María Rivasés (2017), playing games requires us to suspend our cognitive, cultural, social, emotional, and sensory frameworks and immerse ourselves in a new, playful reality that is different from our everyday lives. This is something we do voluntarily. No one can be forced to play games, just as no one can be forced to learn. It is therefore essential to create an environment that is conducive to entering this new space, which is where the role of game facilitators becomes key.

This playful reality involves stepping into a realm of both personal and collective uncertainty, one shaped by ongoing negotiation between the players. It is an ideal shared space for co-creation where adolescents can freely express themselves and participate. Games are unique each time they are played because they provide a blank canvas by their very nature (Rivasés, 2017). This is genuine participation in its purest form. The goal is for group members to immerse themselves in this singular and playful reality and take some or all of their experiences from this space into their everyday lives. We play the game, and then we reflect on what happened and generate new ideas for activities or courses of action in order to continue exploring or addressing the issues that affect us (Braga et al., 2025).

In the field of ludo-pedagogy⁴ it is argued that games provide a means or pathway through which we can learn about the world. The goal is to acquire knowledge in order to transform reality and create a world or rather, multiple worlds, in which equity, justice, freedom, and happiness prevail. This approach aligns with the ethos and goals of what is traditionally known as Popular Education, a concept pioneered by educator Paulo Freire, in which games are used as a fundamental tool to achieve these goals (Castelo, 2023). Consequently, ludo-pedagogy pursues the idea of

⁴ The La Mancha Center in Uruguay is a leading reference in the field of ludo-pedagogy: <http://www.mancha.org.uy/#/-en-un-lugar-de-la-mancha/>

«playing to learn, learning to transform» (Castelo, 2023, p. 16). It involves thoroughly exploring reality from every possible angle with the aim of transforming it.

Of the many methodological approaches that incorporate games, it is our view that critical game-based learning is one of the most closely aligned with the principles of global citizenship education (GCE) (Castelo, 2023). It provides playful, experiential educational resources that encourage participants to explore a wide range of perspectives on and facets of reality in a collaborative, complementary, and, of course, creative manner (Los Glayus Association, 2021).

2. Methodology

Our co-design process began in 2021 with a workshop called «What Are We Worried About?» The workshop was attended by adolescents aged 12-16 who belong to Asturian municipal child and adolescent participation groups which are part of the Los Glayus Association. We used an adapted version of the activity described in James Beane's (2005) book, which produced an unexpected map of concerns.

This enabled us to refine the dimensions and categories of GCE that we had previously been working with from an academic perspective. It also offered insights into which research tools to use to explore how young people navigate the challenges of global citizenship (Calvo & Fueyo (coord.), 2025). This workshop sparked the idea of using games strategically to encourage adolescents to freely express their thoughts and emotions about complex and challenging global issues in a safe, spontaneous, and active way.

From that point on, our team began collaborating on the design and development of a participatory game as an alternative to other commonly used research techniques. The game brought together a variety of GCE-related challenges that met the criteria established by the adolescents. Several experimental prototypes were developed and then tested by young people and professionals from various backgrounds (school and social) to refine and perfect the content, dynamics, materials, and so on. The co-design methodology used to create this game aimed to answer questions such as: How can we most effectively explore the ideas, concerns, feelings, and fears that adolescents have about global challenges and their effects? What concerns them on personal, local, and global levels? Do they feel involved in global issues? If so, in what way? What do they know and feel about these issues?

From its initial design phase, the game was tested extensively, being played numerous times over a period of more than two years in a wide variety of settings. Between 2003 and 2025, it underwent 15 rounds of testing and was tried out by over 400 people from a variety of backgrounds (see Table 1).

- Adolescents and young people from high schools, participation groups for children and young people, vulnerable groups from social organizations, and those attending university extension programs.
- Educational and social professionals, through the delivery of various training workshops.

- Young professionals in training, through undergraduate and master’s degree courses at the Faculty of Teacher Training and Education.
- The general public, during two editions of the European Researchers’ Night at the University of Oviedo, as well as a Storytelling event hosted by the Faculty of Teacher Training and Education.

Table 1. Pilot sessions of the newly developed game.

Date of the pilot session	Groups	Organization
2023	Adolescents aged 12 to 16 from the Castrillón Children’s Participation Group <i>Los Cotorros</i> .	Los Glayus Association
2023	Education professionals from various sectors participating in the Multiplier Event of the R&D project, <i>Global Citizenship and Social Transformation: Current Challenges in Education</i> .	<i>Global Education</i> Research Group (Cantabria) and IETIC EVEA Research Group (Oviedo). Summer courses and extension programs at the University of Cantabria.
2023 y 2024	Adolescents aged 12 to 18 from the «GAM» Adolescence Group.	Mar de Niebla Foundation.
2023	Compulsory Secondary Education students.	Rosario Acuña High School (Gijón).
2023	Compulsory Secondary Education students.	Fernández Vallín High School (Gijón).
2023 y 2024	Attendees at two editions of the <i>European Researchers’ Night</i> .	University of Oviedo.
2023	Students, teachers, and audience members attending the <i>Storytelling</i> event for the Bachelor’s Degree in Pedagogy.	Open Assembly of Education Students at the University of Oviedo.
2023 y 2024	Students enrolled in the <i>Education for Cooperation and Sustainable Human Development</i> course as part of the Bachelor’s Degree in Pedagogy	Faculty of Teacher Training and Education – University of Oviedo.
2024	Young People aged 17-30 from the Medialab <i>Global Shared Citizenship. A space for young people to participate and co-create for global citizenship</i> .	IETIC EVEA Research Group. University of Oviedo university extension program Los Glayus Association
2024	Students enrolled in the <i>Master’s Degree in Intervention and Socio-educational Research</i> at the University of Oviedo.	Faculty of Teacher Training and Education – University of Oviedo.
2025	Professionals from the course <i>Participatory approaches and methodologies in global citizenship education</i> .	Avilés Teacher Training and Resource Center - West, IETIC EVEA Research Group, Asturian Cooperation Agency and <i>Global Education</i> Group of Cantabria.
2025	Compulsory Secondary Education students.	Valle Aller High School (Moreda).

During each session, the facilitators systematically gathered information using various observation guides. An initial template was used to collect observations and suggestions for improving the game's dynamics, the facilitators' roles, how the topics and materials were used, and the design of the instruction cards for the challenges.

The intention was to gradually introduce changes and improvements to the game based on the players' feedback. Information was also gathered on each challenge or task in the game, including players' reactions and suggestions for improvement.

At the same time, a template was designed to document how the groups interacted and participated in light of the inclusion/exclusion dynamics that were a feature of the game.

Table 2. Observation template for inclusion dynamics. Source: Braga & Fueyo, 2025b, p. 25.

Inclusion dynamics	
Elements of analysis	Observations
Group distribution of the adolescents during the activities.	
Marginalization or exclusion of certain individuals by the group.	
Adolescent interaction, including mutual support and co-operation.	
Active participation or non-participation of all adolescents in the game.	
Atmosphere of respect and acceptance of individual differences.	
The group's ability to take advantage of individual differences.	

Each pilot session lasted one hour, followed by a 30-minute reflection session with the players about what happened during the game. The template in Table 3 was used to collect data on the contributions made during this final stage.

Table 3. Template for gathering feedback from the post-game discussion. Source: Braga & Fueyo, 2025b, pp. 23-24.

Closing discussion with participants about the game	
A) About the structure of the game	Did you find it EASY or DIFFICULT to understand? Did you find it ENTERTAINING or BORING? Did it seem LONG or SHORT to you? What did you think was MISSING, and what do you think was UNNECESSARY? Suggestions for improvement? What would you change? Do you think the game is suitable for young people between 12 and 18 years old?
<hr/>	
Closing discussion with participants about the game	
B) About how the game unfolded in this group	How did it make you feel? What did you like best? What did you like least? What topics or issues did you associate with the activities? Which of these topics concern or interest you the most? Why? Do you think this game has anything to do with REAL LIFE? In what way? Can you give an example? Is there anything that happened during the game today that inspires you or motivates you to make a change in your life? What? What do you think the game has to do with the idea of citizenship? How do you rate the role played by the facilitators?

3. Results

After several test runs and revisions to tasks within the game and the methodological guidelines, the final version was released to the public under the title «*Global Quest: What are we doing on the planet?*» (Braga & Fueyo (coord.), 2025a, 2025b).

The full open-access kit includes a game manual with detailed instructions and a list of all the necessary materials, as well as a complementary teaching guide that provides methodological guidelines to support independent use by professionals in socio-educational settings.

All materials are available under a Creative Commons license. In keeping with the open science principles outlined in the introduction, these materials are intended to be an evolving resource. Suggestions for new tasks and ideas for improvement are welcome from young people and professionals alike. We are committed to sharing

contributions of this nature on the website, where all game materials and complementary resources are publicly available⁵.

Global Quest is a collaborative game designed to be played in 90-minute sessions. The game is organized into two distinct phases. One hour is dedicated to playing the game and completing various tasks. This is followed by 30 minutes of discussion and reflection on what took place during the game. The game is recommended for six to 16 participants, ideally between the ages of 12 and 18.

The game is played on a board made up of six islands and a central atoll. Each island is associated with a specific challenge or task. For each task completed, the corresponding island is colored in. The ultimate goal of the game is to color in all of the islands so as to «save the planet.» The tasks focus on four broad thematic areas relating to global citizenship, as identified by the young participants during the co-design process:

- a) Human diversity.
- b) Human and social rights.
- c) Environmental sustainability.
- d) Democracy and participation.

The format of the challenges combines reflective and discussion-based tasks with others involving physical and artistic expression. This approach is intended to incorporate a variety of expressive forms within each challenge (see Table 4).

Table 4. *Global Quest* tasks as they relate to the thematic areas of CGE. Source: Braga & Fueyo, 2025b, p.9

	Human diversity	Human and social rights	Environmental sustainability	Democracy and participation
Physical tasks	Statues that come to life	Are we the same?	Guess the endangered species	Communities vs. multinationals
Reflexive tasks	What do you see in the picture?	The great big negative thoughts factory	Heal the Earth	What do I do on social media?

In line with the principles of open science and game-based learning, the materials provide an opportunity to address any relevant gender and diversity factors, while examining the role of virtual environments in shaping young people's imagination and behavior in relation to global citizenship.

The aim is to avoid oversimplifying something that is inherently complex. In line with critical decolonial pedagogies, the game makes it clear that «saving the planet» is undoubtedly the most challenging task facing humanity today. As in real life, no one can accomplish this alone or fully overcome the challenge. Players must collaborate to solve problems and make decisions by consensus.

⁵ <https://www.uniovi.es/grupoetic/global-quest/>

Although players can color in several islands during a single game, it is impossible to color in (and therefore «save») the entire planet within the allotted time. The tasks are not easy, and the game avoids oversimplifying its messages. Nor is the aim to promote a sense of hopelessness.

For this reason, the various test runs have resulted in recommendations for facilitators to include real-life examples of people who have organized and achieved changes, both small and large, in their communities. Accordingly, in addition to the pedagogies of unrest proposed by decolonial approaches to global citizenship education (Andreotti, 2024; Organization of Ibero-American States for Education, Science, and Culture [OEI], 2022), the game draws on the principles of Paulo Freire's (1993) *Pedagogy of Hope*.^T

The combination of Freire's ideas and contemporary environmentalist perspectives (Goodall & Abrams, 2022) is crucial in addressing the lack of mobilization and organization resulting from young people's pessimism regarding the possibilities for transformation (Andreotti, 2021 & 2024; Pashby et al., 2020; Stein, 2021). This, as we will see, is one of the most significant findings of our research.

It stands to reason that each professional should feel free to customize the tasks within the game according to their own skills and circumstances. Furthermore, the process does not have to end once the game is over. The learning experience can serve as a springboard for exploring major global citizenship issues further through new activities. The facilitators and adolescents work together to decide which additional activities to carry out next.

We do not see the game as an end in itself, but rather as a starting point to spark young people's interest in addressing the challenges facing our planet. Specific sessions can be devoted to designing new challenges for other young people, which the adolescents can then lead.

Ultimately, this material can serve a dual purpose. It can be used to explore adolescents' thoughts on global citizenship and to initiate and implement educational activities, whether curricular or community-based.

4. Conclusion

A qualitative analysis of the observations gathered during the game's test runs identified four areas where the game could be improved compared to the initial version (see Tables 2 and 3).

- a) When dealing with issues of global citizenship education, it is necessary to integrate both local and global perspectives (Rodríguez-Izquierdo & García-Bayón, 2024).
- b) The initial versions predominantly featured reflective tasks. It was then necessary to incorporate expressive tasks, such as movement, theater, art, and creative exercises, to encourage emotional expression and critical thinking (Los Glayus Association, 2021).
- c) To combat pessimism and feelings of despair among young people, it is important to incorporate inspiring experiences that allow facilitators to share

positive, real-life examples of overcoming global problems (Goodall & Abrams, 2022; Klein & Steffoff, 2021).

- d) Facilitators must adopt a flexible approach. They need to be able to gauge the mood and emotions of the group and adapt accordingly. To that end, methodological guidelines are included with the game materials to encourage a flexible approach to group facilitation. Particular attention should be given to how adolescents are grouped during activities, how they interact with one another, the overall atmosphere and mood of the game, and how the group capitalizes on individual differences, among other things (Rivasés, 2017).

Qualitative analysis of the observed data allowed us to identify significant patterns regarding the expectations, anxieties, opportunities, and difficulties that young people face when developing critical global citizenship. According to Humphry et al. (2023), the relationship with digital environments is a key factor in how young people engage with and imagine the global world. The observed data were analyzed in depth to explore the link between young people, virtual environments, and global citizenship. The findings reveal that adolescents are mostly passive participants on networks such as TikTok, Instagram, and Twitter/X. Young people primarily use these platforms for entertainment, to keep in touch with friends, and to follow influencers. Activities related to digital activism or critical information were scarce, and digital spaces were viewed as places of escape rather than as spaces for political action (Fueyo et al., 2025).

During the course of this experience, adolescents often expressed feelings of helplessness in the face of global problems. They pointed to the influence of algorithms and the ephemeral nature of activist virality, as evidenced by the war in Ukraine, where the initial social media impact quickly faded from young people's digital profiles. They also mentioned the symbolic pressure placed on them by adults: «They ask us to change the world, yet they don't listen to us.»

Although some examples of digital activism were identified, such as sharing content about mental health or feminism, they were the exception rather than the rule. Our findings suggest that digital environments encourage spectator citizenship more than participatory citizenship. This poses a challenge for educational transformation.

The roll-out of *Global Quest* provided valuable insights into how young people understand global challenges and how participatory spaces can be revitalized. Qualitative analysis of the interactions revealed that the game created a meaningful space that bridged the gap between theory and practice. This was accomplished by encouraging the researchers to relinquish their epistemological monopoly. This space allowed young people to reflect collectively on social, environmental, and emotional issues from a personal, contextualized perspective.

One of the most notable outcomes was the game's ability to trigger processes that reframe local and global realities. Throughout the tasks and discussions, participants expressed concerns about the ecological crisis, gender inequality, and the psychological effects of the current socio-economic model. These concerns echoed the issues raised in other studies (Stein, 2021; Stein et al., 2024) and arose from the topics discussed and the manner in which arguments were presented, highlighting connections between personal, collective, and structural dimensions.

An analysis of participants' interactions during certain tasks, such as «Heal the Earth» and «Communities vs. Multinationals,» reveals that, despite their limited understanding of global processes in some cases, participants were able to identify the actors involved and the far-reaching social consequences. Of particular note is the task titled «The Great Big Factory of Negative Thoughts.» This activity demonstrated young people's capacity to challenge imposed social norms, reject materialistic ideological frameworks, and exhibit transformative creativity beyond typical adult-centric perceptions of the youthful imagination.

A highly significant and recurring phenomenon was also observed during this process: the difficulty that adolescents have in trusting collective action as a means of transformation (Klein & Steffoff, 2021). Although the game sessions encouraged expressions of commitment and agency through an open science approach, they also allowed feelings of skepticism, mistrust, and powerlessness in the face of major global challenges to come to the fore. The tension between the desire for change and the perception of ineffectiveness is a key finding that underscores the importance of integrating these types of educational experiences into broader institutional and community processes. In this sense, our proposal falls within the critical tradition of depth education, as defined by scholars such as Andreotti (2021; 2024). This approach involves asking uncomfortable questions, problematizing frameworks of expression, and taking on ethical responsibilities in the face of global inequality.

One notable finding is that most adolescents are not actively engaged with global citizenship issues. This may be due to a lack of appropriate contexts and frameworks for engagement, as some studies suggest (Rowland et al., 2024). Social media use is predominantly passive, focusing on consumption rather than digital activism. Pressure from adults and pessimism emerged as factors hindering young people's sense of agency.

It is extremely difficult to effectively implement the right of children and adolescents to participate (Novella & Llana, 2024). For this reason, we are interested in observing the dynamics of participation in groups of young people from an inclusive perspective. Despite its participatory nature, the real-life implementation of the game revealed certain limitations that require critical consideration.

First, imbalances in participation dynamics related to inclusion were identified, indicating the need to review accessibility criteria to ensure the full participation of adolescents with disabilities. Likewise, there were gender disparities in terms of the types of participation exhibited by adolescents. The sessions revealed a clear pattern: girls tended to lead reflective and discursive activities, while boys tended to take on practical or action-oriented tasks. This pattern suggests that certain role expectations influence how young people position themselves within the game space, thereby perpetuating gender stereotypes that remain prevalent in contemporary society.

These two issues demonstrate that the game space, though designed as a tool for critical and collaborative exploration, is not immune to the structural tensions of the society in which it exists. The design, facilitation, and observation of the process must be reviewed with an even greater focus on diversity and the socio-cultural factors influencing young people's real and symbolic participation.

4.1. Final reflections

Global Quest emerged from a cyclical process of development, validation, and reformulation carried out in collaboration with adolescents and educators. This process adheres to the iterative co-design paradigm (Design-Based Research Collective, 2003) and an epistemological framework that champions democratic, critical, and collaborative forms of knowledge production, consistent with the principles of open science (Abadal, 2021; Fecher & Friesike, 2014).

In keeping with the tradition of critical game-based learning (Castelo, 2023), the resulting game is not conceived as entertainment or training. Rather, it is designed to be a space and opportunity for emotional expression, critical reflection, and agency. It moves beyond passive citizenship by inspiring a desire for involvement, deliberation, and transformation. Its modular structure and systematic documentation of experiences ensured the ongoing improvement of the materials and their alignment with the project's participatory goals.

The experience of playing the game demonstrated its potential as an investigative game-based tool and educational catalyst. The process enabled an exploration of young people's conceptions of global citizenship by engaging their emotional, cognitive, and political dimensions. The combination of expressive, playful, and dialogic activities encouraged active engagement and critical dialogue, thereby reinforcing the value of games as research and educational tools. However, its ability to effect real change hinges on the institutional ecosystem in which it is used.

As we observed during the game's test runs, encouraging critical thinking and global awareness among young people requires continuous support from different social spheres. Public policies, community groups, and networks must play an active role in fostering youth engagement and creating environments that encourage genuine participation, where the voices of adolescents are heard, valued, and translated into collective action.

The findings underscore the importance of establishing and sustaining spaces that encourage ongoing youth participation. This experience demonstrates adolescents' ability to think critically, yet also reveals their susceptibility to skepticism about collective action. One possible future course of action is for young people to design new tasks that address emerging concerns, such as mental health, as well as new issues in digital environments, such as the rise of artificial intelligence technologies.

Moving forward, the co-design process should prioritize establishing collaborative networks that encompass educational communities, public institutions, social organizations, and youth groups. Such networks will ensure that these processes are sustainable over time. It is important that the progress made in the game continues beyond the game itself. For this reason, we believe that co-designed materials should not be viewed as an end in themselves or as finished products. Instead, they should be seen as catalysts that pave the way for new, transformative, and contextually-based educational practices.

The research we conducted reinforces the need to extend the implementation of *Global Quest* to diverse geographical and institutional contexts. This would enable

us to compare the game's applicability, adaptability, and appeal in different educational and social environments. We believe it is essential to encourage adolescents to create their own new tasks. Doing so would enrich the game's creative potential and establish it as an open platform for contextualized research. This plan of action must be grounded in hope. Although global challenges are complex (Stein et al., 2024), it is possible for a transformative citizenry to emerge through collective effort, empathy, and shared creativity.

5. Acknowledgements

This article is part of two R&D&I projects funded by the Spanish National Research Council: «La construcción de la ciudadanía global con personas jóvenes» PID2020-114478RB-C22, funded by MCIN/ AEI/10.13039/501100011033/ and «Investigación participativa en laboratorios juveniles de ciudadanía global (GloboLabs)» PID2023-146088OB-C32, funded by MICIU/AEI/10.13039/501100011033/ and FEDER/UE.

We are grateful to all the organizations, professionals, and, most importantly, the adolescents and young adults who participated in the process. We thank them for their generosity, sincerity, and enthusiasm in playing the game and sharing their contributions.

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