

A human-centred approach to innovation to accelerate progress towards the SDGs

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Introduction

Innovation is central to making progress towards the SDGs. This has been widely acknowledged in the 2030 Agenda framework which highlights Science, Technology, and Innovation (STI), and indeed in almost all of the 17 SDGs reference is made to STI.

Humans are central actors in processes of innovation, and yet their role is so far insufficiently recognized in discussions about how to harness STI for progress towards the SDGs. This policy brief thus lays out the case for a human-centred approach to innovation to accelerate progress towards the SDGs. It further offers a brief overview of what findings from the related interdisciplinary literature suggest should be the guiding policy choices at the strategic level. Finally, it concludes by calling for developing, in a multi-stakeholder co-production process, a research agenda for such a human-centred approach to STI for SD.

Humans¹ engage in innovation processes, as generators of ideas, creators, everyday bricoleurs, inventors, innovators and change agents. They interact with complex and simple technologies from day to day, and act as decision-makers for themselves and others, on the use of technologies. Humans make such choices about technology use for themselves, their children, their pupils, patients, and indeed as business leaders or policy makers, on wider populations. Thus, the design, practice, use, and regulation of STI is all intertwined with humans, human learning, and human choices.

Much of the STI for SDG literature and policy documents have focused on innovation systems, innovation policy, innovation mechanisms and innovation finance. This needs to be balanced with an understanding of humans in the innovation process. In particular, there are particular human characteristics which learning processes should foster (see Box 1).

Learning processes that help develop these characteristics can take a variety of forms, including formal and informal education, training, family and community socialization processes, workplace experiences, and engaging in communities of practice.

¹ When speaking about humans in this paper, we need to acknowledge more-than-human dimensions in at least two ways. Humans are part of, and not in some way separate from nature. Further, as artificial intelligence and bioinformatics develop, human-technology relationships are evolving and boundaries are becoming ever more fluid.

Examples of human characteristics to be fostered in formal and informal learning settings:

For Science and Innovation

- Curiosity
- Open-mindedness to different kinds of knowledge
- Creativity
- Motivation
- Entrepreneurial spirit

For Technology:

- Life-long learning
- Willingness to make human judgements about the risks and opportunities of technology use
- Ethical considerations in technology design
- Design-readiness: ability to engage in design processes

For Collaboration towards the SDGs:

- Cooperation
- Willingness to think in multiple dimensions, reflecting the complex social, economic, ecological, and cultural goals of the Agenda 2030
- Willingness to engage in cross-cultural dialogue and perceive human and cultural diversity as a richness not a threat or technocratic problem to solve

Box 1: Which human characteristics should STI for SD learning processes foster?

Expanding perspectives and abandoning fallacies

Economics and related disciplines have offered key insights to the discussion of humans in the innovation process. However, many of the contributions have taken an instrumentalist position asking what “human capital” is required to increase labour productivity, or what training needs there are to meet labour market requirements. Where human beings have been seen as creators of ideas and innovators, this has often followed a narrow model (e.g. citing Silicon Valley) of both the innovator and the nature of the innovation. This is an important, but insufficient framing of human beings and their role in innovation, which deserves to be brought into dialogue with perspectives from other disciplines for a more holistic understanding.

A human-centred approach would include and combine these interdisciplinary and transdisciplinary perspectives. In doing so, it will undertake some vital re-framings and also move the discourse beyond these key fallacies:

Fallacy 1: Too many framings take an instrumentalist view of humans. There is however both a moral and a practical case to be made for the intrinsic value of humans. While the moral case is well documented in the UN Charter, the practical case rests on the fact that creativity and innovation frequently does not only result from narrowly goal-oriented or efficient human behaviour, but also from curiosity, playfulness, and affective states such as joy and flow – traits of humans which are not best understood from an instrumental perspective.

Fallacy 2: Many framings of innovation privilege economic innovation. However, there is ample evidence of social innovation playing a vital role towards development impacts. Thus, when harnessing STI for the broader set of SDGs, it is necessary to consider also social innovation, ecological innovation, and cultural innovation.

Fallacy 3: The pretense of predictability. Development discourse, policy and practice is replete with linear multi-year plans, theories of change, output and outcome targets, action plans and pathways to impact. Yet innovation is rarely linear, and also includes serendipity, the unforeseen, the unintended, cycles of trial and error, failing forward and sudden breakthroughs. Thus, the organizational social norms, mechanisms and tools used in the SDG policy community may have to be adjusted to create space for these kinds of agile innovation processes.

Fallacy 4: The wrong role models. Innovation discourses, and digital innovation discourses in particular, have frequently celebrated individual entrepreneur figures that often looked like the Silicon Valley white, young, male entrepreneur (McCarrick & Kleine 2019). These suggested role models also represent, in some cases extreme personal wealth accumulation and narcissistic behaviours. They are successful by the standards of entrepreneurship but are detrimental to some SDGs (such as SDG 10 Reduce Inequalities). For STI to be successfully directed towards SDGs, the discourse, imaginaries, and visualisations of what an entrepreneur looks like will need to be more inclusive (including different genders, ethnicities, abilities, places of origin and motivations) and innovators from the majority world need to be platformed more. Further, instead of the celebration of individual excessive and unsustainable wealth, values of collective solidarity, public service and entrepreneurial responsibility need to be championed.

STI for SD: A new agenda for personal psychological resources

Social capital has been described as the capital of the poor, however in reality there are several non-material resources that are essential for positive sustainable development processes that do not necessarily depend on material or financial resources (Kleine 2013). Among these are information, educational resources (formal and informal), social resources and psychological resources. Psychological resources include ability to envision, imagination, curiosity, self-confidence, and entrepreneurial spirit as well as tenacity and resilience (Kleine 2013). These resources are non-rival – while global environmental or material resources are limited and thus rival, growth in human psychological resources can be non-rival and can be sustainable.

Humans have agency and can generate novel ideas and unpredicted innovative actions. This experience of exercising agency and successfully shaping, in whatever form, one's own world has been termed self-efficacy by psychologist Alfred Bandura. Studies have shown that academic self-efficacy beliefs correlate with excellent academic results (Gallagher, 2012). Learners who believe that they have agency in their own learning process, and think they can

through their actions make progress towards a learning goal are the ones who are more likely to do well academically. This research suggests that instilling high levels of self-efficacy beliefs in young children could have profound effects on the course of their education. Thus, education needs to foster the effort-based self-confidence and self-efficacy of learners.

A human-centred approach to STI takes a holistic view of the learner as a human being with intrinsic dignity rather than human capital that is to be shaped. As educationalists such as Maria Montessori have argued, curiosity, joy in learning new things and creativity should be fostered, and this requires relationships and affective dimension of the learning process to be nurturing and free of fear. Overall, humanist perspectives to education have centred the human being and have framed the learning process as a holistic process which affects behaviours, thoughts, and feelings of learners.

Criticism of such an approach would include the point that it is related to a view of humans as the pinnacle of creation or evolution, and as an exceptional species. As a species, humans have often had profoundly detrimental and unsustainable impacts on the planet. The behaviour of many humans is causing mass extinction of other species and climate change. Further, where this anthropocentrism is entangled with Western Enlightenment notions, or even coopted by colonial enterprises and sometimes racist narratives, other, more environmentally conscious cosmovisions by diverse other cultures across the world have been marginalized (Jimenez et al 2020).

Thus, a human-centred approach in an era of a global climate crisis (see SDG 13) and a biodiversity crisis (see SDG 14 and 15) needs to recognize humans' role and responsibilities among other species and the environment. Further, such a human-centred approach needs to be inclusive and draw on the wisdom of different cultures.

Psychologists such as Maslow have argued that there is a hierarchy of needs, sometimes represented in a pyramid, with basic needs such as food and bodily security at the bottom and self-actualisation (including creativity and problem-solving) at the top. While the pyramid model suggests a fixed progression, Maslow acknowledged that different human needs exist in parallel. To use a practical example, school breakfast schemes for income-poor students have been shown to raise academic

outcomes, while learning in school can take place even when for instance in violence-affected neighborhoods some security needs remain unmet.

Humanist educators stress the importance of instilling human values such as cooperation, dignity, self-responsibility, and social justice. Where education takes place in the context of socially unjust situations, some educators such as Paulo Freire, working in Brazil, have argued for education to be seen as an emancipatory process of both building skills (such as literacy and digital literacy) and then, through critical dialogue among learners and with educators, *conscientização* – development of consciousness.

A human-centred approach recognizes the role of the teacher as an important actor in the learning process, including the affective dimension of the learner-teacher relationship. It favours reduced hierarchies and horizontal learning practices. Teachers become “crafters of an environment that supports learning” (Schunk 2014), where learners feel nourished and free to explore, experiment, make mistakes and problem-solve – in other words, to innovate. This experience of self-fulfilling learning grows learners’ psychological resources of self-confidence, self-efficacy, and motivation, which in turn strengthen their innovation capacity.

STI for SD: A new agenda for learning

To develop a human-centred approach for STI for SD, there is a need to examine different perspectives on the process of learning as developed in pedagogy, behavioural sciences, and psychology. A classic distinction is made between behaviourist and constructivist approaches, which are each based on different epistemologies. Early behaviourism emphasizes observable behaviour, trained “correct” responses to a given stimuli. Constructivist approaches on the other hand emphasizes the role of the human in “constructing” their own realities (Piaget), both internally and externally.

Thus, methods such as rote learning, learning by heart and repeating back existing facts, are linked to behaviourist approaches. By definition these repeat existing knowledge and mechanisms, and thus this method is suitable for basic knowledge transmission but unsuitable for developing innovation skills.

Constructivism acknowledges multiple knowledges and complex realities, as well as centering the

agency of the learner (Kay and Kibble 2016). Through a process of guided discovery (Lockey et al. 2021) a process can be initiated where individual learners are supported in constructing their own subjective learning process.

Social constructivism as advocated by Vygotsky and others, argues that knowledge is constructed through social interaction and collective negotiation of meaning. Thus, learning is framed as a dialectical process.

The emphasis of social constructivism on learning as a process of dialogue is important not only for the learning aspect, but also for achieving a joint sense of purpose towards the SDGs. Human beings will need to negotiate about different scientific and technological futures under the SDG umbrella, and this will require dialogue across diverse knowledges, cultural norms, and personal commitments.

Proponents of situated learning have long since argued that learning is embedded in specific sociocultural contexts and communities of practice. Communities of practice are groups of professionals situated in a specific sociocultural context, and in fostering such communities of practice, not just the task itself but the sense of belonging to this community plays a role in motivating learners (Lockey et al. 2021). Creativity is thus not just individual but also a collective notion.

Thus, constructivism moves away from a view of the learner as an empty vessel that needs to be filled with knowledge, to learners being humans with agency and previous experience that they bring to the dialectical learning process and to individual and collective problem-solving.

In some of the literature on digital skills there has rightly been an emphasis on such constructivists and learner-centred approaches. However, there were also extreme cases, such as in the early days of the One Laptop Per Child (OLPC) initiative, that focused so much on the computer and the individual learner that at the start it sought to bypass teachers. This was not successful and instead where OLPC has worked to a degree, such as in Uruguay, it has been where teachers, have remained involved in co-designing the learning process (Villanueva-Mansilla 2015).

A further important point to note is how setbacks and supposed failure is handled in the learning process. Trial and error is an important mechanism for learning, as is learning from a model. Thus, it matters how teachers treat errors and setbacks. Are they seen as a natural part of the learning process or as something that deserves ridicule, criticism or

models of innovation. However, their reach and recognition, and thus cross-cultural dialogue is limited. UN discourse and policy should support work on a diversity of perspectives.

3) The SDGs are a collective endeavor with a

If you don't make any mistakes, you are not being innovative enough (Hamid Akhavan)

even punishment? Logically, behaviourism knows correct and incorrect responses, while constructivism has a far wider window of tolerance for different answers to the same question or solutions to the same problem.

For STI, it is essential that the learning process normalizes mistakes and makes failure, analysis and retry an accepted and valuable part of learning. Since learning also has important affective dimensions and learners' psychological resources need to be fostered, it is important to adopt discursive and classroom practices which frame failure in a way that does not dent learners' sense of self-confidence and self-efficacy.

Policy recommendations

Based on a human-centred approach to innovation, it is possible to offer a number of policy recommendations.

- 1) Given the complexity of the area and the holistic nature of the approach, the relevant UN inter-agency working group should invite expertise from an interdisciplinary group of researchers, including scholars of technology and innovation, sociologists, economists, experts from development studies, geography, anthropology, education, ecologists, psychologists, and ethicists. In addition, perspectives from non-Western knowledge systems should also be sought.
- 2) Support for conceptual work from non-Western perspectives. Several member country governments are developing alternative development models, and some engage with alternative, non-Western

normative joint purpose of positive change. Only a sub-set of the SDGs is compatible with individualistic, profit-focused, and frequently ecologically unsustainable forms of innovation. However, this is the form of innovation that is best documented in media and scientific literature. To harness STI towards the SDGs, UN agencies need to actively shape the discourse and imaginations of what innovation is. This could for instance mean investing in documenting more pro-social, pro-environmental case studies and commissioning research to analyse their strengths and weaknesses.

- 4) If the premise is agreed that multiple forms of innovation will be necessary for progress towards the SDGs, then firstly, social, ecological, cultural, and political innovation need to be recognized alongside economic and technological innovation. Further, economic, and technological innovation are areas where partners such as the private sector are directing investments, with often fewer policy concerns remaining, one of them being to ensure inclusion for those less able to pay. The other innovation areas need further support, discursively and financially, from UN agencies with their respective remits.
- 5) Aligned with the optimistic tone of many development policy documents, UN discussion of innovation is frequently characterized by "techno-optimism by default". More work needs to be done exploring the ecological and social impacts of innovation, unintended consequences of STI, and also ethical aspects.

- 6) As discussed in fallacy three, development policy is often focused on predictability, while innovation is frequently non-linear. Where UN agencies act as funders of innovation-focused work, they will need to find a balance between accountability mechanisms such as log frames and pre-planned deliverables, and recognizing the emergent and unpredictable nature of innovation. A possibility could be to have some funding strands designed to be more conducive to the emergent nature of innovation.
- 7) Supporting good inclusive innovation practices. National governments and UN agencies should support initiatives that platform “unusual suspects” as innovators, such as women, people of colour, those from the global South, those with a disability, refugee and displaced people, and vulnerable groups. This includes initiatives focused on workplace diversity, STEM education, design challenges and co-production.
- 8) In the area of learning pedagogies for innovation, there is a need to pay particular attention to those at risk of being left behind, by providing safe and supportive learning environments and recognizing the needs of learners for food, shelter, hygiene facilities and safeguarding. Further, engaging in partnerships with teachers so that they can support more constructivist and creative learning approaches. The response to mistakes needs to be constructive, not punitive, for learners to find enjoyment in the learning process.
- 9) Policy, pedagogy, and practice should focus on supporting the development of the psychological resources of the learners, including self-efficacy, creativity, curiosity, motivation, tenacity and resilience.
- 10) Some aspects of the role of STI for SDGs have been extensively researched and documented in the literature. However, a human-centred approach to innovation opens up an extensive new research agenda with many new or as yet under-researched

questions. Thus, it is necessary to direct funding towards this area: Firstly, for research, at interdisciplinary theory, policy and case study level and secondly, for holding multi-stakeholder events that connect research, policy, member states, business and civil society.

Co-producing a research agenda

Going forward, there is thus a need to co-produce, with diverse stakeholders, including different UN agencies, universities and research institutes, a multi-pronged research agenda for a human-centred approach to STI for SDGs.

Pillars of this research agenda will include:

- 1) Strengthening personal psychological resources (agency, self-efficacy, creativity)
- 2) Learning processes and pedagogy (learners, teachers and classrooms)
- 3) Education Systems (policy)
- 4) Innovation Systems (policy)

The research agenda will frame efforts, inform policy, develop knowledge, and foster a network of policy makers, researchers and practitioners.

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