

# Challenge Driven Education for Sustainable Global Development

## KTH Global Development Hub Position Paper

Margareta Norell Bergendahl (*maggan@kth.se*), Anders Rosén (*aro@kth.se*), Jesper Vasell (*vasell@kth.se*), Ramon Wyss (*wyss@kth.se*), KTH Royal Institute of Technology, Stockholm, Sweden, 13 March 2018.

The world's most pressing challenges have been formulated by the UN in Agenda 2030 as 17 Sustainable Development Goals (SDGs). The broad consensus regarding the SDGs clearly proves that the creation of a sustainable world involves challenges that are shared by all nations. To reach these goals will require science based societal transitions which are enabled by education, research, and innovation. With this view on the global challenges, we advocate that academic institutions have a significant and systemic role to play.

### GDH mission and objectives

KTH has created the Global Development Hub (GDH) as a platform for students, faculty and external stakeholders to engage in *Global Development Engineering*. To accomplish progress towards a sustainable world, GDH promotes experience sharing and mutual learning between countries with disparate living conditions. The aim of GDH is to develop mutual innovation capacity through new ways of working and collaborating cross-culturally and cross-disciplinary towards the SDGs. GDH therefore engage in close partnerships with a number of universities from sub-Saharan Africa. GDH is hence not an aid project, it is a long-term collaboration for mutual benefit. The primary objective of GDH is to promote implementation of a *Challenge Driven Education model* that integrates challenges related to the SDGs into the regular curriculum of the involved universities. GDH will make KTH and its partner universities acknowledged for providing the society with graduates who can become change agents that are driving sustainable development.

### Challenge Driven Education

KTH has a long tradition of open ended project based learning in the engineering education. Some of the educational programs have included industrial challenges since the 1980-ies. Later collaborations with for example Stanford University and University of Tokyo, has involved international student team work. Some projects have focused on developing countries supported by SIDA and other agencies. KTH has also, in collaboration with MIT and others, developed the CDIO initiative which is an innovative educational framework stressing engineering fundamentals set in the context of developing real-world systems and products. Some of these efforts and developed teaching and learning methods are described in the *Guide to Challenge Driven Education* (Magnell & Högfeldt 2015). In the *KTH Development Plan* for 2018-2023 it is stated that elements of challenge driven education should now increase in all study programs. GDH is an integral part of these endeavours.

### CDE<sup>GDH</sup>

In the Challenge Driven Education model promoted by GDH – which we here refer to as CDE<sup>GDH</sup> – teams of students from different disciplines with different background and perspectives collaborate on developing environmentally, socially, and economically sustainable solutions to the challenges of our time. The starting point for the learning process is a challenge defined by external stakeholders in a local context that is related to one or several of the SDGs. Such challenge owners can for example be governments, municipalities, private sector corporations, or NGOs. It will be up to the students, with appropriate supervision, to analyse the challenge in dialogue with the stakeholders; choose and develop approach and methods; manage the team and the project; and develop and present solutions. The aim is to generate societal impact, both in terms of the students' developed knowledge, skills, innovation capacity, professional confidence and network, but also in terms of the developed solutions when implemented. CDE<sup>GDH</sup> is hence based on four pillars: (a) interaction between the stakeholders and the university, (b) student teams with multiple perspectives, (c) mutual faculty training and development programs, d) impact through solutions that address SDGs and the creation of innovation capacity. As described above there are already today some challenge driven courses at KTH. To stimulate further development of these courses, and development of new courses, for increased focus on societal challenges, sustainable development, and development of mutual innovation capacity, GDH has formulated the following criteria for courses that could be included in the GDH program.

CDE<sup>GDH</sup> course criteria:

1. The course:
  - 1.1. is project based involving teams of students;
  - 1.2. is integrated into the regular curriculum;
  - 1.3. is open to students from different disciplines;
  - 1.4. has capacity to enrol students from the GDH partner institutions.
2. The project address a societal challenge:
  - 2.1. which is clearly related to one or several of the sustainable development goals (SDG) in the UN 2030 Agenda;
  - 2.2. which is identified by external stakeholders who can act as challenge owners;
  - 2.3. where the development of a solution requires knowledge and skills beyond that of a single discipline.
3. The learning process:
  - 3.1. is driven by the challenge in the sense that the challenge is the starting point determining the choice of disciplines and methods;
  - 3.2. is student centred in the sense that it shall be up to the students to: analyse the challenge in dialogue with the stakeholders; choose and develop approach and methods; manage the team and the project; develop, evaluate, document and present a proposal of a solution; and outline strategies for its implementation;
  - 3.3. is facilitated and supervised by teachers with appropriate competences who can introduce the students to project management and design methodologies, e.g. design thinking or systems engineering;
  - 3.4. is assessed continuously through the course, by peers as well as by teachers, formative as well as summative, team-wise as well as individually.

GDH promotes implementation of CDE<sup>GDH</sup> in existing and new courses at KTH and at the partner universities by:

- facilitating and co-funding course development;
- facilitating and co-funding student collaboration between KTH and the partner universities;
- supporting teachers training and facilitating collegial collaboration between teachers within KTH and between KTH and the partner universities;
- facilitating collaboration between the universities and external stakeholders.

## Concluding remarks

The primary impact of the implementation of CDE<sup>GDH</sup> are students with skills and confidence to solve societal challenges, bridging the gap of disparate backgrounds, living conditions and cultural context, collaborating for a sustainable global future. Mutual innovation capacity is developed by collaborating on building innovation capacity towards common and shared goals. Additional impact will be achieved through innovation processes following CDE<sup>GDH</sup> courses and projects, where the solutions proposed by students are actually being implemented in products and services. Pathways towards frugal and reverse innovation as well as inclusive business are expected outcomes of the partnership. Yet another long-term objective of GDH is to establish a globally recognized research program in the area *Global Development Engineering*.

## References

- [1] KTH, 2018, *A leading KTH – A leading technical and international university creating knowledge and competence for a sustainable future*, Development plan 2018–2023, [https://intra.kth.se/polopoly\\_fs/1.782478!/KTH\\_Utvecklingsplan\\_ENG.PDF](https://intra.kth.se/polopoly_fs/1.782478!/KTH_Utvecklingsplan_ENG.PDF)
- [2] Magnell M, Högfeldt A-K, 2015, *Guide to challenge-driven education*, ISBN: 978-91-7595-089-1, KTH, Stockholm, <https://www.kth.se/social/group/guide-to-challenge-d/>
- [3] UN, 2015, *Transforming our world: the 2030 Agenda for Sustainable Development*, UN Resolution A/RES/70/1, <https://sustainabledevelopment.un.org/post2015/transformingourworld>