JSS ACADEMY OF HIGHER EDUCATION & RESEARCH
(DEEMED TO BE UNIVERSITY) MYSURU

Education 2030

SUSTAINABLE DEVELOPMENT GOALS

Division of Molecular Biology
JSS AHER, SS Nagar, Mysuru- 570015

Education for Sustainable Development Goals

Teaching & Learning Objective Handbook

Education for

Sustainable Development Goals

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By 2030, ensure that all learners acquire knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

Source: United Nations, 2015

FOREWORD

The Sustainable Development Goals (SDGs) introduced in the year 2015 is a follow up of the Millennium Development Goals (MDGs) implemented in 2000. It is a vital framework, which calls attention to meet the challenges towards creating a sustainable future with an impressive target of “Leaving No One Behind”. Achievement of SDGs calls for collective efforts of stakeholders from Government, Non-governmental organizations, Higher Educational Institutions, Multi-national agencies, Civilian organizations, and Public.

While the countries around the globe are seriously addressing several issues on the way towards achieving the SDGs, it is becoming evident that these goals cannot be achieved in complete if the younger generation are not made aware of the goals. The best possible means of reaching the youth is through the curriculum, either in schools or in universities. The United Nations has called upon the countries to incorporate the SGDs into the existing curriculum, aligning the teaching and learning aspects in line with the goals. JSS Academy of Higher Education & Research has emerged as a renowned institute in the country by providing quality education of highest standards through innovation in academic and research activities even during the most difficult times, for instance, the recent pandemic. JSS AHER has initiated the task of educating students and staff on the SDGs by incorporating the goals into the existing curriculum. Under the able guidance of the HEI, School of Life Sciences is committed to contribute towards achieving the SDGs through its multi-disciplinary academic excellence, research, innovation, environmental protection, and inclusiveness. Since its inception, the School of Life Sciences has seen an exponential growth in a short span of time due to the unique programs, which are being offered in five departments and eight divisions, keeping in mind the problems of the society. The School sees that most of the activities are closely aligned with the vision of sustainable development goals. The programs are designed to address the issues of the society pertaining to water, health, food and environment. The school stands today as a unique institution in the country known for multidisciplinary and interdisciplinary teaching and research in Life Sciences. We have attempted to identify potential courses that can be aligned to the tune of SDGs in the curriculum across the syllabi, which were recently revised according to the NEP 2020.

I take this opportunity to express my sincere gratitude to the leadership of JSS Academy of Higher Education & Research for their constant support and cooperation towards all our initiatives. I thank all the faculty members both teaching and non-teaching for having contributed towards a noble cause of achieving the SDGs through Education.

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Professor & Head
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PREFACE

The 2030 Agenda for Sustainable Development, which was adopted by all UN Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet now and in the future. The 17 Sustainable Development Goals (SDGs) are at the heart of it, and they are an urgent call to action by all countries, developed and developing, in a global partnership. They recognise that eradicating poverty and other deprivations requires strategies that improve health and education, reduce inequality, and stimulate economic growth – all while combating climate change and working to protect our oceans and forests.

The Division for Sustainable Development Goals (DSDG) of the United Nations Department of Economic and Social Affairs (UNDESA) now provides substantive support and capacity-building for the SDGs and related thematic issues such as water, energy, climate, oceans, urbanisation, transportation, science, and technology. The DSDG is important in the evaluation of the UN system, the broad implementation of the 2030 Agenda, and advocacy and outreach activities related to the SDGs. To make the 2030 Agenda a reality, broad ownership of the SDGs must translate into a strong commitment to implement the global goals by all stakeholders.

The SDGs are also highly relevant to universities and the tertiary and academic sectors in general. The SDGs address a wide range of complex social, economic, and environmental challenges, and addressing them will necessitate changes in how societies and economies function, as well as how we interact with our planet. Education, research, innovation, and leadership will be critical in assisting society in addressing these issues. Universities, with their broad approaches to knowledge creation and dissemination, as well as their unique position within society, play a critical role in achieving the SDGs.

Molecular medicine includes the study of molecular and cellular phenomena in biological systems, molecular aspects of human diseases, the human body's response to diseases, response heterogeneity and personalised medicine, stem cells, immune response, and genetic determinants. The course discusses the use of molecular knowledge in disease prevention, drug development, diagnosis, and therapy discovery research.

The emphasis on an interdisciplinary approach in which medical sciences, molecular and biochemical aspects of biology are addressed is one of the course's distinguishing features. All students must complete a one-year thesis research project in which they will gain hands-on experience with molecular biology techniques, cell culture, biochemical techniques, and genetic analysis.

Molecular medicine studies the molecular aspects of human diseases as well as how the human body reacts to drugs/personalized medicine, stem cells, immune therapy, and genetic determinants. As a result, the course aims to train students in the molecular and cellular understanding of biochemical mechanisms involved in disease contexts to develop diagnostics or therapeutics, as well as to prepare them to work in academia or industry and serve the community.

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INTRODUCTION

The Sustainable Development Goals – an ambitious and universal agenda to transform our world The United Nations General Assembly adopted the 2030 Agenda for Sustainable Development on September 25, 2015. (UN, 2015). Following the United Nations Conference on Sustainable Development in Rio de Janeiro, Brazil in June 2012, a three-year process involving UN Member States, national surveys involving millions of people, and thousands of actors from around the world resulted in the development of this new global framework.

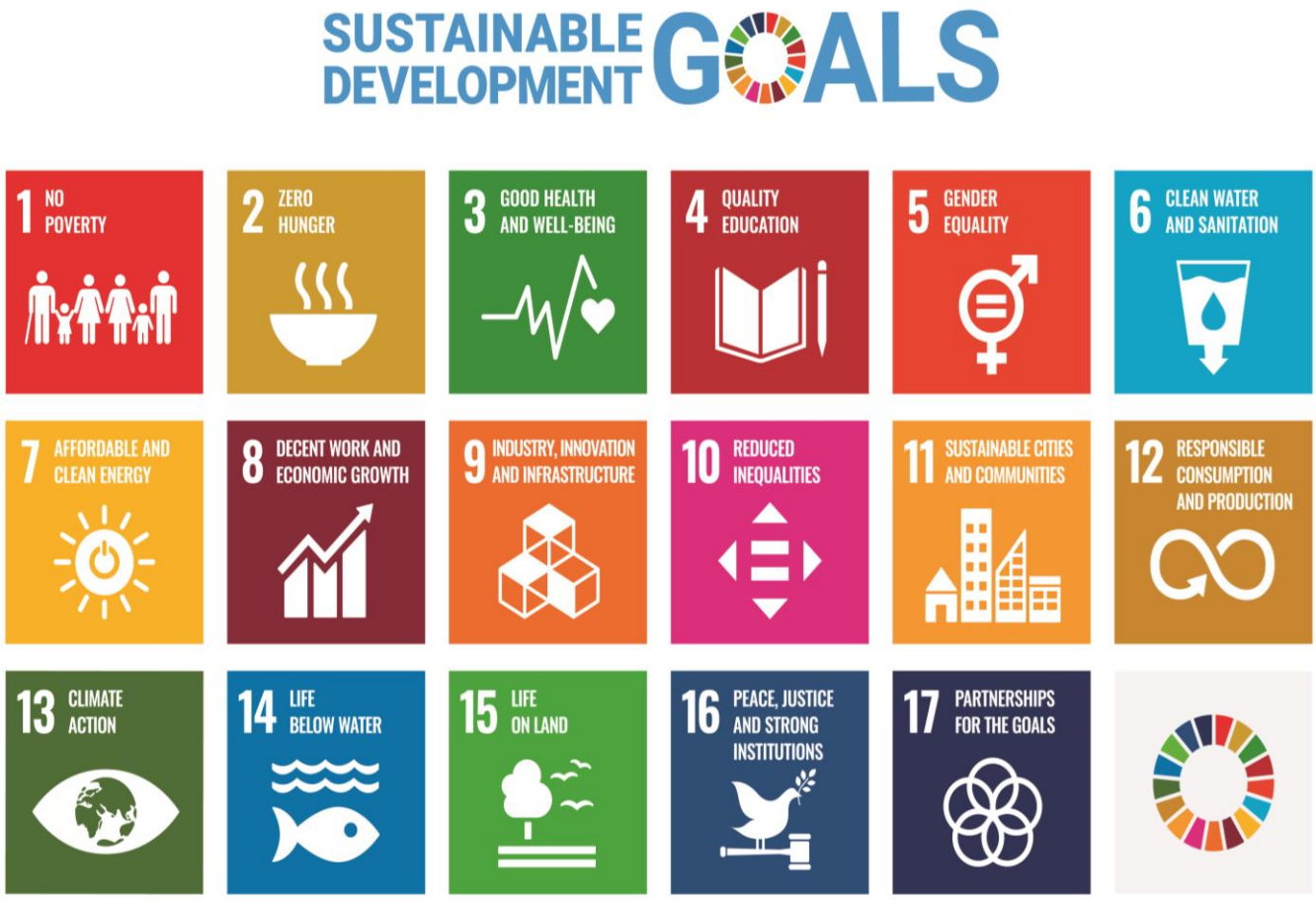
The 2030 Agenda is built around 17 Sustainable Development Goals (SDGs). The SDGs, which are universal, transformative, and inclusive, describe major development challenges for humanity. The 17 SDGs seek to ensure a sustainable, peaceful, prosperous, and equitable way of life for all people now and in the future. The goals address global issues that are critical to humanity's survival. They establish environmental boundaries and critical thresholds for the use of natural resources. The goals recognize that poverty alleviation must be combined with economic development strategies. They address a variety of social needs such as education, health, social protection, and job opportunities, as well as climate change and environmental protection. The SDGs address key systemic barriers to long-term development, such as inequality, unsustainable consumption patterns, insufficient institutional capacity, and environmental degradation.

To achieve the goals, everyone must contribute: governments, the private sector, civil society, and every human being on the planet. Governments are expected to take ownership of the 2030 Agenda and establish national frameworks, policies, and measures for its implementation.

The universality and indivisibility of the 2030 Agenda for Sustainable Development is a key feature. As target countries, it addresses all countries – from the Global South to the Global North. To achieve sustainable development, all countries that subscribe to the 2030 Agenda must align their own development efforts with the goal of promoting prosperity while protecting the planet. Thus, in terms of the SDGs, all countries can be considered developing, and all countries must act quickly.

The 17 Sustainable Development Goals (SDGs)

1. No Poverty – End poverty in all its forms everywhere
2. Zero Hunger – End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Good Health and Well-Being – Ensure healthy lives and promote well-being for all at all ages
4. Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Gender Equality – Achieve gender equality and empower all women and girls
6. Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all
7. Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable, and clean energy for all
8. Decent Work and Economic Growth – Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all
9. Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduced Inequalities – Reduce inequality within and among countries
11. Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient and sustainable
12. Responsible Consumption and Production – Ensure sustainable consumption and production patterns
13. Climate Action – Take urgent action to combat climate change and its impacts
14. Life below Water – Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Life on Land – Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16. Peace, Justice and Strong Institutions – Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

Education for Sustainable Development Goals
Incorporation of courses/topics supporting SDGs in regular curriculum of M.Sc. Molecular Biology

Name of the Course **MOLECULAR DEVELOPMENTAL BIOLOGY**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Application of genetically modified food for Development		✓	
Topic related to SDG 3 Molecular basis of early development and differentiation	✓		
Topic related to SDG 4 Have fundamental knowledge of animal embryonic development, how an egg develops into an adult.	✓		

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner knows conceptions of health, hygiene and well-being and can critically reflect on them, including an understanding of the importance of gender in health and well-being. • The learner knows well-being, including reproductive health and information as well as early warning and risk reduction.
Socio-emotional Teaching & learning objectives	• The learner can communicate about issues of health, including reproductive health, and well-being • The learner can create a holistic understanding of a life of health and well-being, and to clarify related values, beliefs, and attitudes. • The learner can develop a personal commitment to promoting health and well-being for themselves, their family, and others, including considering volunteer or professional work in health and social care.
Behavioral Teaching & learning objectives	• The learner can plan, implement, evaluate, and replicate strategies that promote health, including reproductive health, and well-being for themselves, their families, and others. • The learner has the capacity to perceive when others need help and to seek help for themselves and others.

Examples of learning approaches and methods

- ✓ Health problems of vulnerable groups and in the most vulnerable regions, and an understanding of how gender inequalities may affect health and well-being
- ✓ Direct strategies to promote health and well-being, e.g. vaccines, healthy food, physical activity, mental health, medical consultation, education, reproductive health education including education about pregnancy and safer sex and family planning
- ✓ Encourage learners to address school students on future developmental biology prospects through interactive sessions.

Suggested topics for student workshops/training

- ✓ Organize a laboratory activities
- ✓ Learn to develop SOPs to handle laboratory equipment's

Name of the Course **GENE MANIPULATION**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Aspects of food security and increased production		✓	
Topic related to SDG 3 Application of Gene manipulation in health and medicine Agriculture and improvement of livestock	✓		
Topic related to SDG 4 Knowledge about latest technologies in the field of genome editing and synthetic biology.	✓		
Topic related to SDG 9 Knowledge of applications of genetic engineering in various fields like forensics, biomedical technology Role of innovation and ideation to create small scale industries	✓	✓	

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner understands the impacts of poverty and can critically think of possible ways of reducing poverty through proper employment opportunities. • The learner can understand the importance of identifying alternative technologies to produce surplus food, which can, in turn, reduce hunger. • The learner can be aware of various opportunities available in the industries.
Socio-emotional	• The learner can motivate partners to create awareness about

Teaching & learning objectives	the impacts of poverty and hunger. • The learner can raise awareness about quality products, which do not cause harm. • The learner can show sensitivity to issues related to gender equality in industries and working places.
Behavioral Teaching & learning objectives	• The learner can plan experiments to implement, evaluate, and replicate activities that contribute to poverty reduction. • The learner can include ethics in whatever task is carried out. • The learner can propose solutions to address systemic problems related to good health, etc., through quality education.

Name of the Course **IMMUNOLOGY AND VACCINE DEVELOPMENT**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Aspects of food security and increased production		✓	
Topic related to SDG 3 Application of Biotechnology in health and medicine Agriculture and improvement of livestock	✓		
Topic related to SDG 4 Understand scientific principles behind T and B Cell-Mediated immune Response.	✓		
Topic related to SDG 9 Immune response against infectious agents and tumour cells for vaccine development Role of innovation and ideation to create small scale industries	✓	✓	

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner can understand the importance of identifying alternative technologies to produce modified drug or vaccine for the diseases. • The learner can be aware of various opportunities available in the industries. • The learner understands equal rights and opportunities for employment.

Socio-emotional Teaching & learning objectives	• The learner can motivate partners to create awareness about the impacts of vaccine against the diseases. • The learner can raise awareness about quality products, which do not cause harm.
Behavioral Teaching & learning objectives	• The learner can plan experiments to implement, evaluate, and replicate activities that contribute to suppress the diseases. • The learner can join hands with community workers and contribute towards reducing diseases. • The learner can propose solutions to address systemic problems related to good health, etc., through quality education.

Name of the Course **TISSUE ENGINEERING & REGENERATIVE MEDICINE**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 3 Assess the role of different biomaterials used for therapeutics	✓		
Topic related to SDG 4 Knowledge on basics of tissue engineering- growth and differentiation of tissues will be learnt.	✓		
Topic related to SDG 9 Develop Bioartificial organs like the pancreas, renal system using tissue engineering techniques.	✓		

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner can understand the importance of identifying alternative technologies to produce regenerative medicine. • The learner can be aware of various opportunities available in the industries. • The learner understands equal rights and opportunities for employment.
Socio-emotional Teaching & learning objectives	• The learner can collaborate with local community through extension activities and transfer basic technology required for sustainable production. • The learner can raise awareness about quality products, which do not cause harm.
Behavioral Teaching & learning objectives	• The learner can plan experiments to implement, evaluate, and replicate activities that contribute Regenerative Medicine. • The learner can include ethics in whatever task is carried out.

Name of the Course **CELL AND TISSUE CULTURE TECHNIQUES**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Aspects of food security and increased production	✓		
Topic related to SDG 3 Assess the role of different secondary metabolites used for therapeutics	✓		
Topic related to SDG 4 Assess the methodologies in plant tissue/cell culture, horticulture & floriculture to plant improvement.	✓		
Topic related to SDG 9 Production of special secondary metabolites/ products. Production of vaccines using animal cell culture.	✓		

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner understands the impacts of poverty and can critically think of possible ways of reducing poverty through proper employment opportunities. • The learner can understand the importance of identifying alternative technologies to produce surplus food, which can, in turn, reduce hunger. • The learner can be aware of various opportunities available in the industries. • The learner understands equal rights and opportunities for employment.

Socio-emotional Teaching & learning objectives	• The learner can motivate partners to create awareness about the impacts of poverty and hunger. • The learner can collaborate with local community through extension activities and transfer basic technology required for sustainable production. • The learner can raise awareness about quality products, which do not cause harm. • The learner can show sensitivity to issues related to gender equality in industries and working places.
Behavioral Teaching & learning objectives	• The learner can plan experiments to implement, evaluate, and replicate activities that contribute to poverty reduction. • The learner can join hands with community workers and contribute towards reducing hunger. • The learner can include ethics in whatever task is carried out. • The learner can propose solutions to address systemic problems related to poverty, hunger, good health, etc., through quality education.

Name of the Course **CANCER AND STEMCELL BIOLOGY**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Aspects of Healthy food and lifestyle		✓	
Topic related to SDG 3 Assess the role of different stem cell technology used for therapeutics. Gene discovery in cancer research.	✓		
Topic related to SDG 4 Strategies of anticancer gene therapy/translating therapies from the laboratory to the clinic.	✓		
Topic related to SDG 9 Cancer immunity and strategies of anticancer immunotherapy, stem cells and their applications in cancer therapy.	✓		

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner understands the impacts of poverty and can critically think of possible ways of reducing cancer progression with proper lifestyle • The learner can understand the importance of identifying alternative technologies to produce surplus food, which can reduce the tumor.
Socio-emotional Teaching & learning objectives	• The learner can motivate partners to create awareness about the cancer. • The learner can raise awareness about varies aspects of cancer progression.

Behavioral Teaching & learning objectives	• The learner can join hands with community workers and contribute towards reducing cancer. • The learner can include ethics in whatever task is carried out to overcome the cancer progression. • The learner can propose solutions to address systemic problems related to cancer progression, through quality education.

Name of the Course **MEDICAL GENETICS & RARE DISEASES**	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Aspects of food security and genetically modified food production		✓	
Topic related to SDG 3 Application of Genetics in health and medicine		✓	
Topic related to SDG 4 create awareness about the impacts of disease progression.	✓		
Topic related to SDG 9 Introduction to biotechnology industries and products of economic importance Role of innovation and ideation to create small scale industries	✓	✓	

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner can understand the importance of identifying alternative technologies to produce surplus food, which can, in turn, reduce hunger. • The learner understands equal rights and opportunities for employment.
Socio-emotional Teaching & learning objectives	• The learner can collaborate with local community through extension activities and transfer basic technology required for sustainable production. • The learner can raise awareness about quality products, which do not cause harm.
Behavioral	• The learner can plan experiments to implement, evaluate, and

Teaching & learning objectives	replicate activities that contribute to poverty reduction. • The learner can join hands with community workers and contribute towards reducing hunger.

Name of the Course APPLICATIONS OF GENOMICS & PROTEOMICS	Already covered in the curriculum	Proposed to be incorporated into the curriculum	
Topic related to SDG 2 Aspects of food security and increased production		✓	
Topic related to SDG 3 Application of Biotechnology in health and medicine Agriculture and improvement of livestock	✓		
Topic related to SDG 4 Application of the Proteomics and genomics to learner can be aware of various opportunities available in the industries.	✓		
Topic related to SDG 9 Introduction to Genomics & Proteomics and products of economic importance Role of innovation and ideation to create small scale industries	✓	✓	

Teaching & Learning objectives

Cognitive Teaching & learning objectives	• The learner understands the impacts of poverty and can critically think of possible ways of reducing poverty through proper employment opportunities. • The learner can understand the importance of identifying alternative technologies to produce surplus food, which can, in turn, reduce hunger. • The learner can be aware of various opportunities available in the industries. • The learner understands equal rights and opportunities for

	employment.
Socio-emotional Teaching & learning objectives	• The learner is able through participatory methods to motivate and empower others to demand and use educational opportunities. • The learner can recognize the importance of their own skills for improving their life, for employment and entrepreneurship.
Behavioral Teaching & learning objectives	• The learner can use all opportunities for their own education throughout their life, and to apply the acquired knowledge in everyday situations to promote sustainable development.

Suggested topics for SDG 4 "Quality Education"

The Education 2030 agenda, and innovative and successful case studies from across the globe

Basic skills and competencies needed in the 21st century

Knowledge, values, skills and behaviours needed to promote sustainable development

Examples of learning approaches and methods for SDG 4 "Quality Education"

Develop partnerships between schools, universities and other institutions offering education in different regions of the world

Plan and run a quality education awareness campaign

Conduct a case study on the education system and access to education (e.g. enrolment in primary education) in selected communities or countries

Plan and run a project at a school or university, or for the local community on quality education

CONCLUSIONS

Individuals and institutions can help to achieve the SDGs by developing cross-cutting sustainability competencies required to deal with a wide range of sustainability challenges and to connect the various SDGs. Learners can be equipped with specific cognitive, socio-emotional, and behavioral learning outcomes that will enable them to deal with the specific challenges of each SDG.

To enable everyone around the world to act in support of the SDGs, all educational institutions must consider it their responsibility to deal intensively with issues of sustainable development, to foster the development of sustainability competencies, and to develop specific learning outcomes related to all SDGs. As a result, it is critical not only to incorporate SDG-related content into curricula, but also to employ action-oriented transformative pedagogy.

Education officials, policymakers, educators, curriculum developers, and others are being urged to rethink education to contribute to the achievement of the SDGs between now and 2030. This guidance introduces the sustainability competencies and specific cognitive, socio-emotional, and behavioral learning outcomes relevant to this goal, and it outlines what is required to implement SDG learning through Educational Institutions.

Education for Sustainable Development Goals - Teaching & Learning Objectives

Individuals must become sustainability change-makers to create a more sustainable world and engage with issues related to sustainability as described in the Sustainable Development Goals (SDGs). They need the knowledge, skills, values, and attitudes that will enable them to contribute to long-term development. Thus, education is critical for achieving sustainable development, and Education for Sustainable Development is especially important because it empowers learners to make informed decisions and act responsibly for environmental integrity, economic viability, and a just society for current and future generations.

This handbook instructs readers on how to use education to achieve the SDGs. It identifies teaching and learning objectives, recommends topics and learning activities for each SDG, and describes implementation at various levels, ranging from course design to national strategies. The document is intended to assist policymakers, curriculum developers, and educators in developing strategies, curricula, and courses to promote SDG learning.

'Touching the lives of Millions'

The JSS Mahavidyapeetha has grown from strength to strength by focusing on a goal that is both broad and specific: improving quality of life through Human Development. For centuries, the underlying philosophy of Jagadguru Sri Veerasimhasana Mahasamsthana Math, Suttur Srikshethra has been a long and healthy life, education for all, and a decent standard of living, all indicators of human development. This is also the philosophy that the Mahaidyapeetha stands for today.

The Mahavidyapeetha has seen tremendous growth in the field of education thanks to the unwavering efforts of Jagadguru Dr. Sri Shivarathri Rajendra Mahaswamiji, and now has over 300 institutions under its umbrella, ranging from kindergartens to postgraduate centres and postdoctoral research, catering to the educational needs of over 100,000 students.

The Mahavidyapeetha continues to play an important role in broadening its activities to include several fields of knowledge, welfare, and culture. Its educational efforts include crèches for working rural women's toddlers, schools that provide primary and secondary education in Kannada and English, colleges, polytechnics, technical schools, medicine, and so on. It has a large infrastructure and an army of dedicated and highly qualified human resources to help it achieve its mission. These strategically located institutions serve a wide range of society, from virtually remote tribal villages to metropolitan cities like Bengaluru, Noida, New Delhi, Ooty, and Coimbatore, in addition to their presence in the United States, Mauritius, and Dubai.

Apart from formal education, the initiatives extend to integrated rural development through training and empowerment of rural folk, providing healthcare to people through modern and traditional Indian systems of medicine, supporting literary activities, visual arts, performing arts, and temple and historical monument restoration.