Modern higher education
Modern education methods, Training of Trainers (ToT)

Promotion of Sustainability in the Textile and Garment Industry in Asia-FABRIC

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

FABRIC Asia

Modern higher education

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on behalf of giz FABRIC and adelphi consult GmbH Berlin

Modern Higher Education Methods, Training of Trainers (ToT)

i. Introduction to Modern Higher Education
ii. Modern Education Methods
iii. Training of Trainers (ToT)
iv. Example 1: Chemical Management in the Textile and Garment Industry
v. Example 2: Learning with(in) Augmented Reality / Virtual Reality = AR/VR

Modern Engineering Education

The Evolution of Engineering Education

Teaching and learning has a long tradition since the early ages of our civilization. The Greek philosopher Aristotle, teacher of Alexander the Great was distinguishing between theoretical science and practical science. The theory he purely understood as a mental model of the main characteristic nature, but the practical science must prove itself in its applicability.

Modern Engineering Education in Germany

Following Aristotele´s approach the German Christian-Peter W. Beuth was distinguishing between theoretical and practical knowledge.
Until the end of the 18th century Germany was dominated by rigid economic nationalism (Mercantilism). In 1806 Napoleon defeated the Prussian empire and structural reforms became unavoidable. Among other reformers like W. Humboldt who liberalized the German administration and trade, C.P.W. Beuth reformed the education system along with K.F. Schinkel (Architecture / Urban Planning) and P.J. Lenné (Gardening / Landscape Design).

Modern Engineering Education in Germany

Modern Engineering Education in Germany

Engineering education in Germany started with C.-P. Beuth who can therefore be called the **founder of the German engineering education** system.
Beuth on his part recognized that for **industrialization new forms of education, based on the practical application of knowledge** was essential. He founded the poly-technical institutes (in German: Gewerbeinstitute) which were focused on practical scientific and technical knowledge transfer.

Beuth organized **exchange visits for faculty and students**. Knowledge about new technologies and know-how which was gained during visits were **shared / spread among the poly-technical institutes**. This knowledge transfer paved the way for the industrial development of the then reformed German state.

Today Germany is a country of considerable educational development and its engineering education attracts many foreign students. The latest reform of the education system was initiated by the European Bologna reform, which led to Bachelor and Master study programs in Germany. Among the different fields of education **sustainability concepts were integrated in to all engineering disciplines**.

Sustainable Development Topics in Modern Education

Environmental disciplines supporting Sustainable Development

- Environmental disciplines supporting sustainable development of developed and emerging economies are recognized by many Governments worldwide as an important area requiring special attention.
- The promotion of Universities and research facilities and other Institutions of the so called “knowledge systems” has become more and more important in the field of development cooperation worldwide.
- In a recent publication of the Worldbank the development of Educational Institutions was given top priority.

Sustainable Development Topics in Modern Education

Sustainable Development Topics in Modern Education

Modern higher education for sustainable development

- is an integral process which deals with human interrelationship with his natural and man made surroundings, including the relation of population growth, pollution, energy demand, resource allocation and depletion, conservation, technology and urban and rural planning to the total human environment.
- relates to studies of the factors influencing ecosystems, mental and physical health, living and working conditions, decaying cities and population pressures.
- is intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our sustainable development and to improve or maintain the quality of life.
- is meant a set of organized curricular and co-curricular experiences designed to bring about the needed changes in knowledge, understanding, attitudes, and skills pertaining to environment, energy conservation, renewable energies, ecological balance and sustaining it.

However, engineering education alone must not be considered as a solution for all problems related to sustainable development. Engineering for sustainable development should be supplemented by corresponding social and political action.

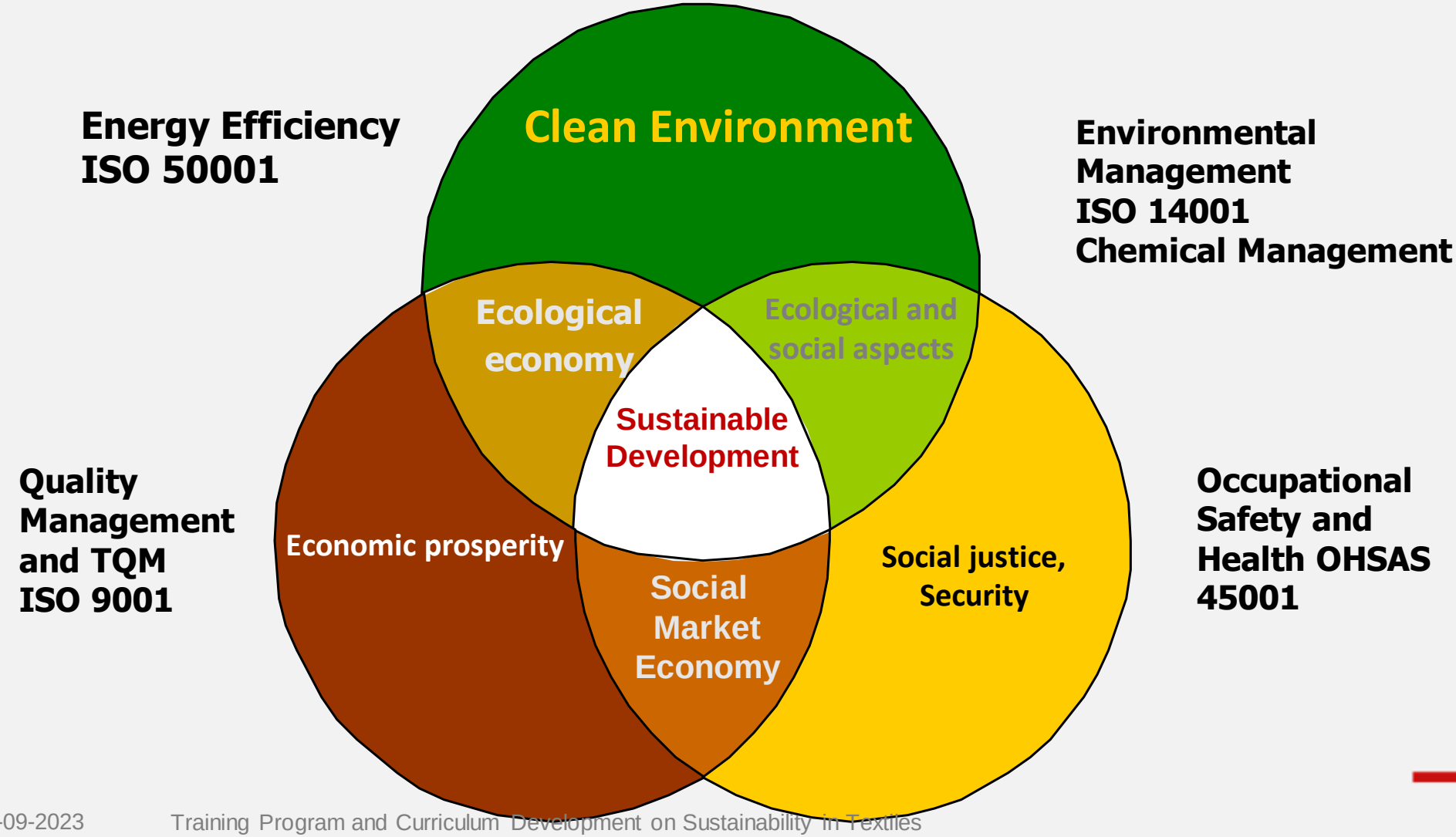
Integrate Sustainability Topics in Curricula for a Sustainable Development

More specifically, the objectives of Sustainability Topics in education programs are

- **Awareness** – to motivate individuals and social groups acquire an awareness of global environmental problems.
- **Knowledge** – to train the students to acquire an understanding of the importance of sustainability.
- **Attitude** – to help the society to acquire social values, strong feelings of concern for the global environment and the motivation for actively participating in Sustainability programs.
- **Skills** – to give hands on experience to engineers and scientists to acquire the skills for solving problems.

Modern Engineering Education in Sustainability is an integral process which deals with technical measures, environmental management, legal frameworks, support mechanisms, new technologies, technology transfer, investment appraisal and management of sustainability projects.

The 3 vital Elements for Sustainable Development



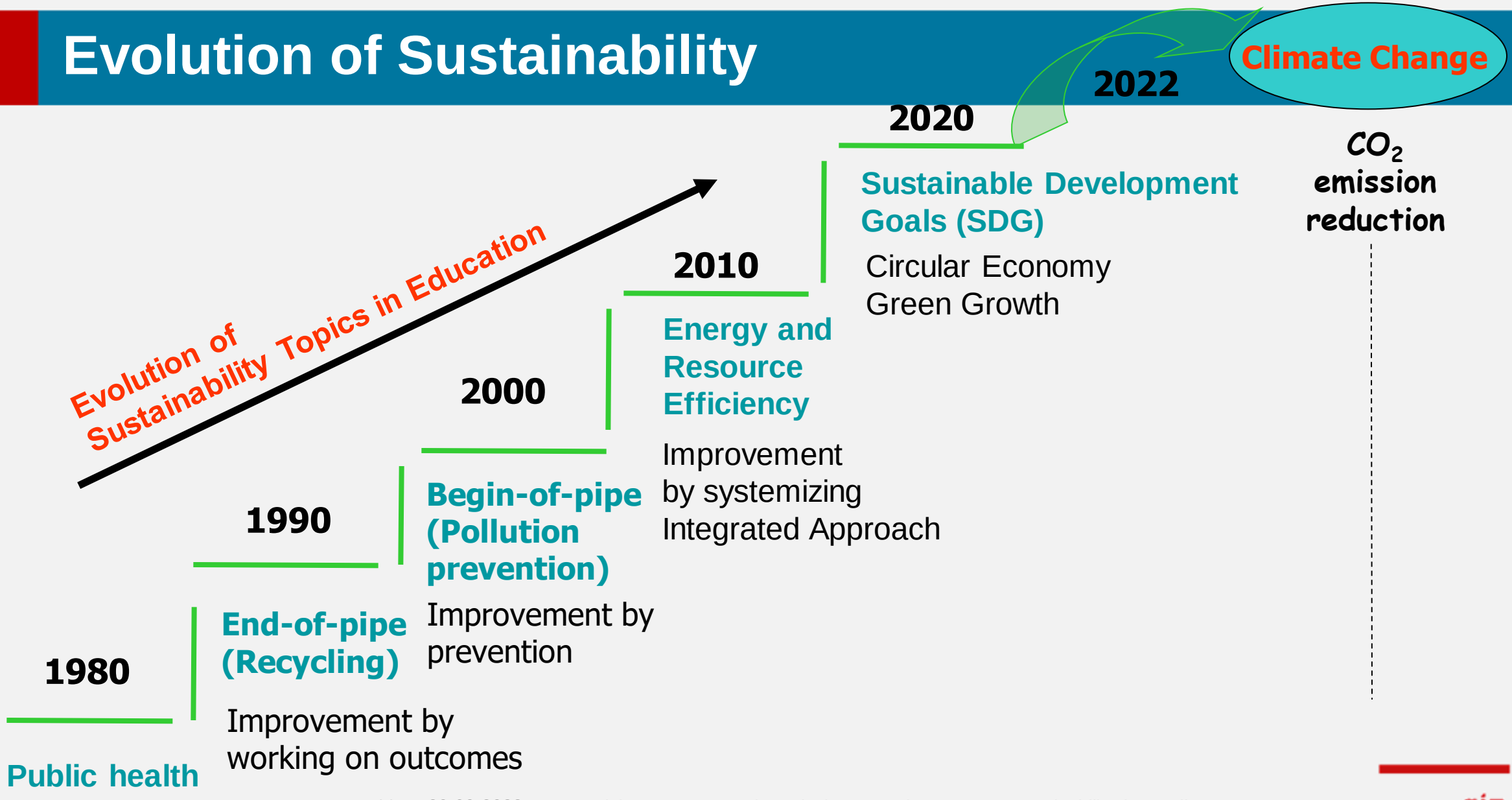
Sustainable Development Topics in Modern Education

The success of Sustainable Development Topics in Modern Education would depend on internalizing the following principles:

Modern higher education:

- **considers sustainability in its totality**
- **on sustainability is not a one shot learning approach. It is a life long process encompassing all levels of education.**
- **is a challenging area requiring both disciplinary and interdisciplinary approach.**
- **following holistic approach rather than a "piece by piece" subject oriented approach.**
- **includes students as citizens having a moral obligation and responsibility towards following generations**
- **requires that public and private educational institutions work in alignment**
- **must cater to all sections of society: professionals and the general public as well as non specialists**
- **requires local, national and interuniversity cooperation for the solution of environmental problems**

Evolution of Sustainability



Transfer and Application of Knowledge

The availability, the transfer and application of knowledge of a society is a determining economic factor.

Most important and vital for sustainability aspect integrated into the curricula is the generation of local knowledge which will be applied for solving local problems.

Within expanding knowledge systems so called **„distributed knowledge production system“** of different competing Education- and Research institutions the quality of the Education and Research decides over their success.

Ref. Adobe Stock, learn, from Julien Eichinger

More and more Universities try to be customer oriented and adjust their programs to the current demand at the job-markets.

Promoting International Exchange Programmes

Promoting international exchange programmes and critical thinking

Nowadays virtual online Universities are formed, autodidactic / self learning online courses offered and we speak about the continuation of learning even for adults in modern living.

This new tools bring people from different countries together, creating **modern learning environments which are international, multicultural, interdisciplinary and multigenerational.**

In many Nations the Education should develop the **ability to analyse things and criticise them,** discuss whatever is considered as strange or wrong whenever needed.

In the Asian context **critical remarks might be seen as a negative input** and will very seldom be promoted. In many countries the traditional teacher who educates the students with pedagogical drill is still predominant even up to the tertiary student level.

According to the knowledge of **Modern Education** this type of Education is outdated and regarded as contra-productive.

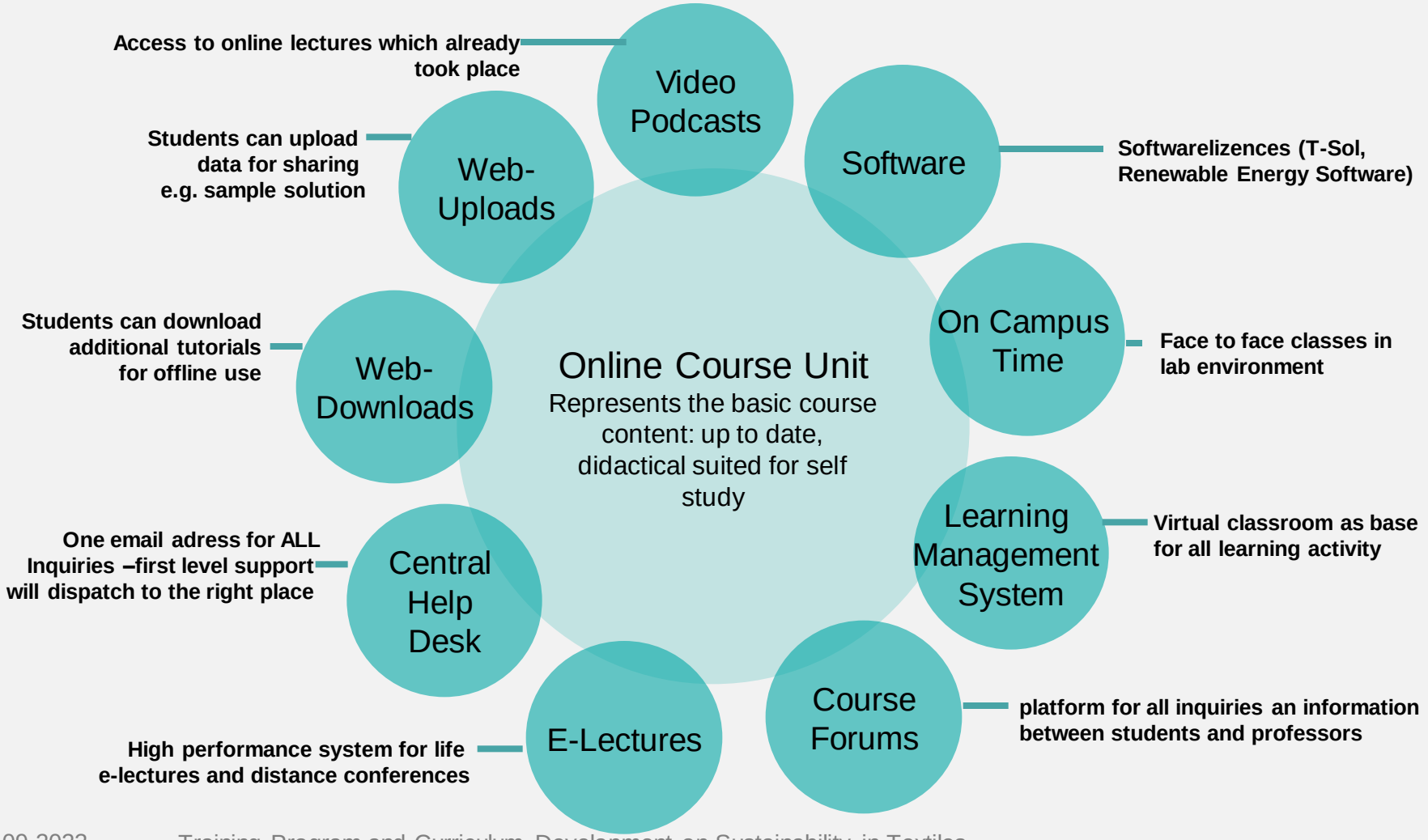
Ref. Adobe Stock,Green city, by 9comeback

Theoretical Science and practical Science

- Aristoteles was distinguishing between theoretical Science and practical Science. The Theory he purely understood as a mental model of the main characteristic nature but the **practical science must prove itself in its applicability.**
- Since than it is known that the techniques involved in the process of **transferring knowledge** are very important for the success of the learning procedure: Practical training is the most sustainable method to transfer knowledge.
- So **in the process of drafting Curricula** a special focus should be on the stepwise progress of learning by doing in order to motivate the students to implement the things they have already learned theoretically.

Ref. Adobe Stock, Teacher pointing to machine, everyone smiling, by auremar

Online Courses - Blended Learning Concept

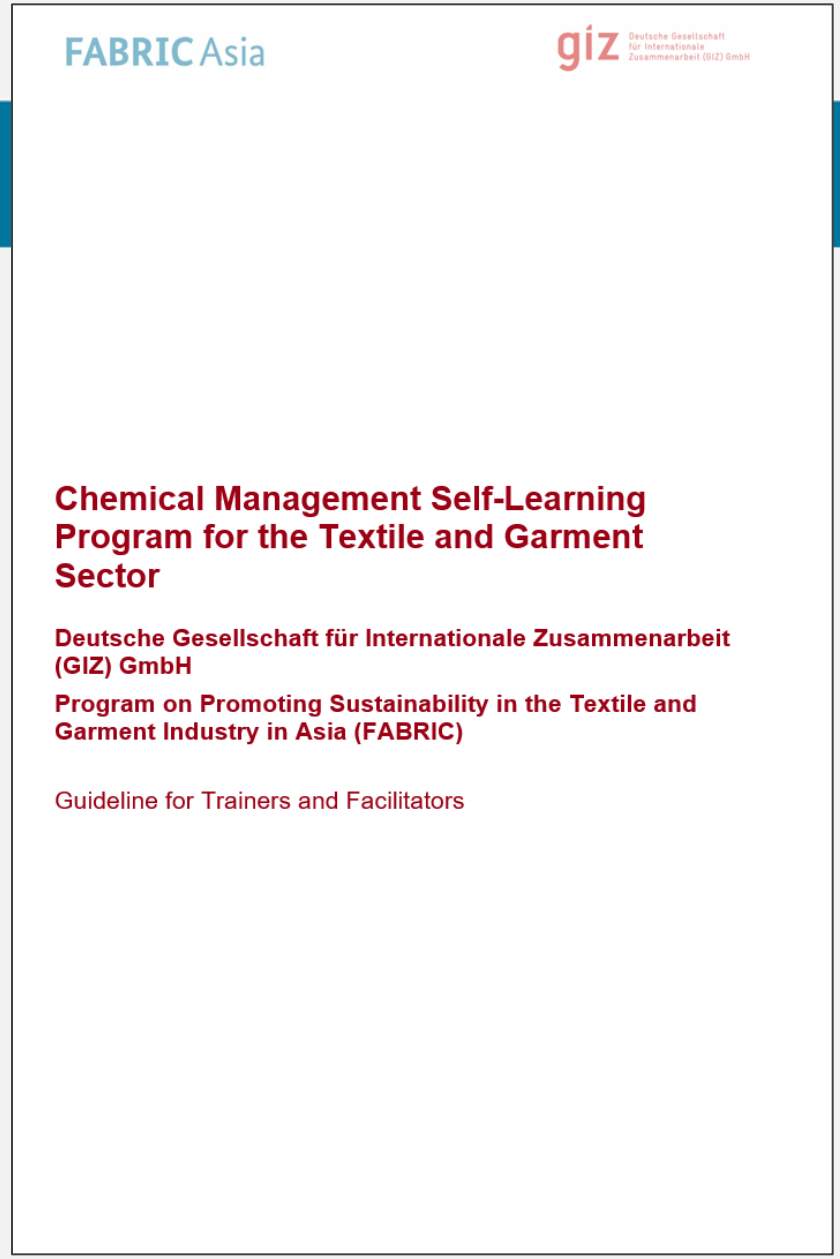


Training of Trainers (ToT)

Training of Trainers

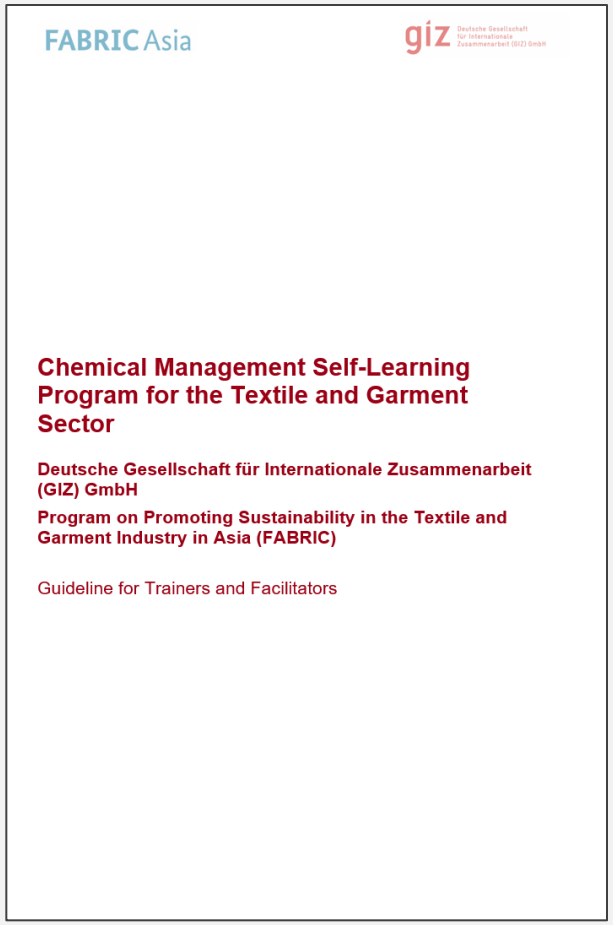
For modern education the Institute of Distance Learning trains Professors, lectures, faculty and scientific staff in didactics, presence and online training, learning platform usage and application, webinar management among others.

One example is the Training of Trainers guide for the online education in Chemical Management Self-Learning Program for the Textile and Garment Sector :



Ref. FABRIC, Chemical Management Self-Learning Program for the Textile and Garment Sector – Guideline for Trainers and Facilitators, 2021 giz

Training of Trainers (ToT)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Chemical Management Self-Learning Program for the Textile and Garment Sector

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Program on Promoting Sustainability in the Textile and Garment Industry in Asia (FABRIC)

Guideline for Trainers and Facilitators

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ToT -Guide

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Training of Trainers (ToT)

Training of Trainers (ToT) - Guide

Learning Platform (moodle) usage

Course development

Tracking progress of learners

Grades

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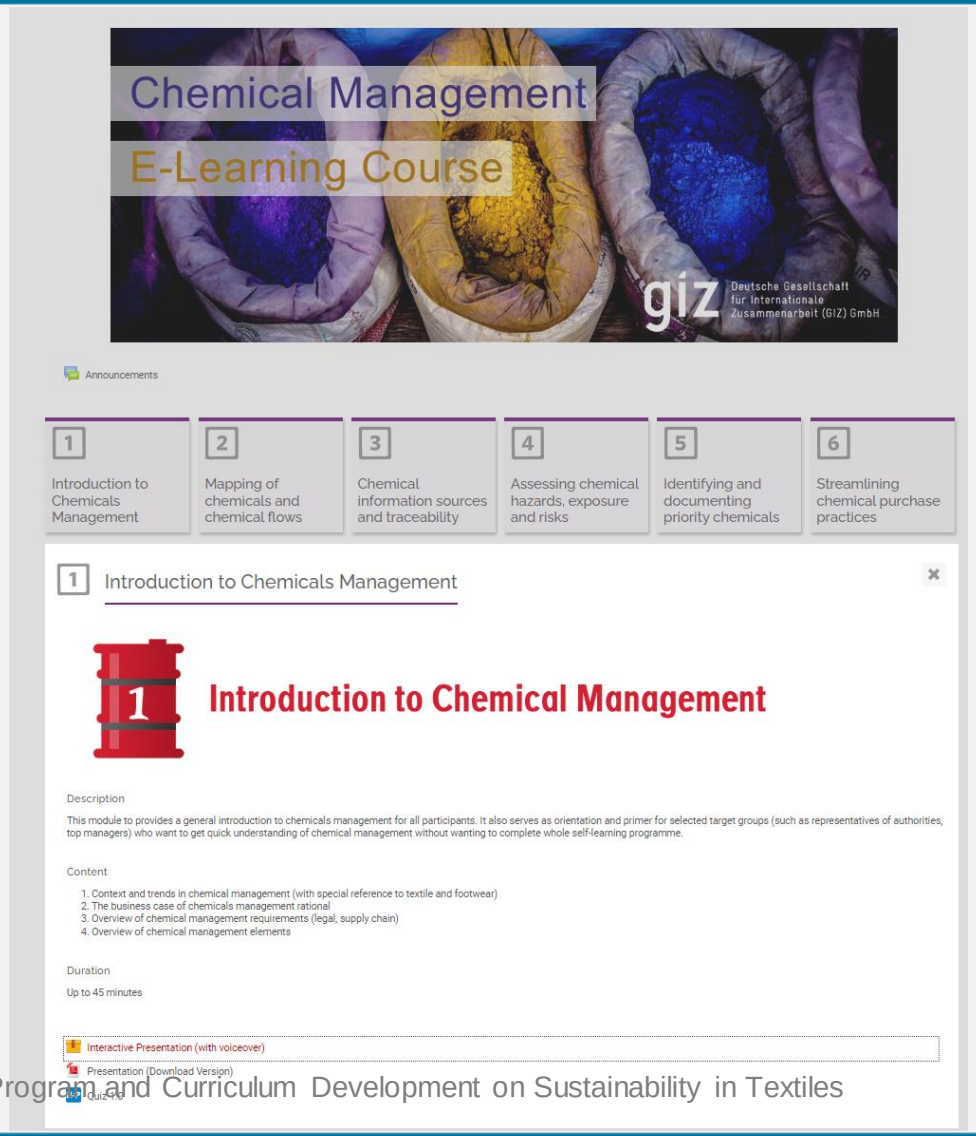
Chemical Management in the Textile Industry



- **Ref. Atingi platfrom, giz, https://moodle.learning-os.com/course/view.php?id=4**
- **Last visited on 08.06.2022**

Sustainable Development Topics in Modern Education

Integration of sustainability topics into Modern Modular higher Education

In order to integrate sustainability topic into modern higher education the educational bodies should consider the following points:

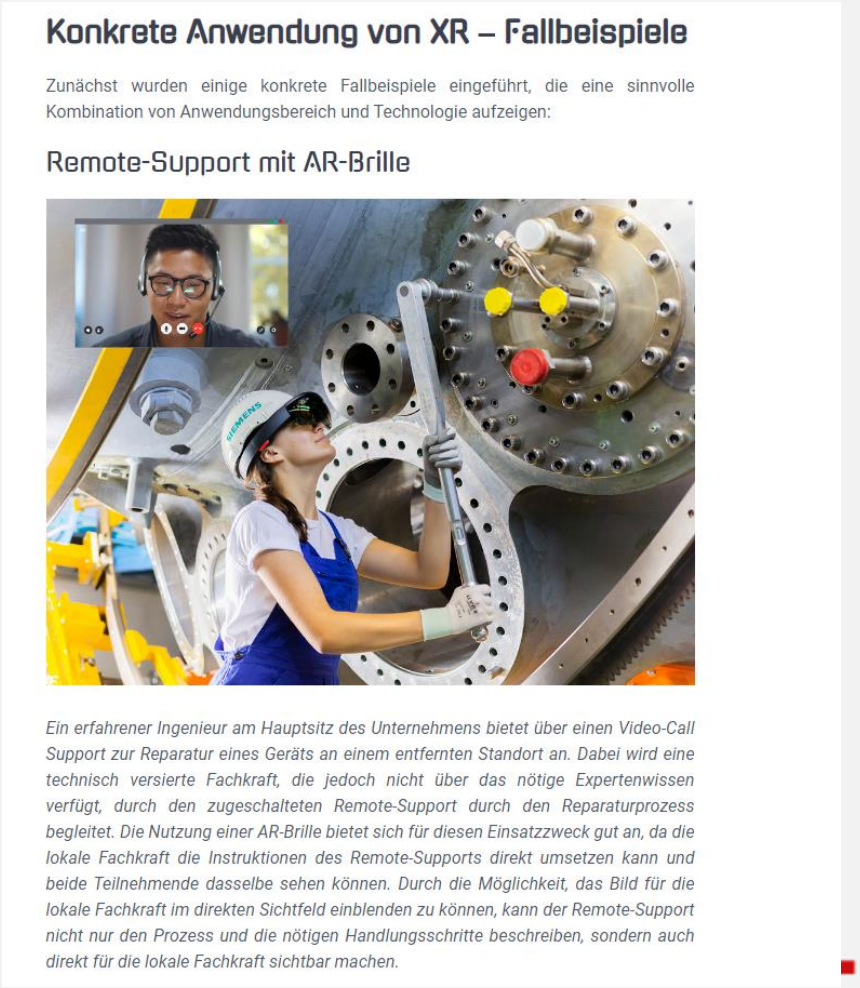
- Form interdisciplinary teams
- Promote international exchange programs
- Create modern learning environments
- Implement modern teaching techniques and means
- Enable new learning environments (online / blended / Augmented Reality / Virtual Reality = AR/VR)
- Ability to criticize and to analyse situations
- Build up evaluation abilities
- Promote practical training of engineers

Finally higher Education in sustainability topics should attempt to imbibe in learners a value oriented thought to take care of the environment.

Augmented Reality / Virtual Reality = AR/VR

Modern Education / Teaching with or within Augmented Reality / Virtual Reality = AR/VR

An experienced engineer at the company's headquarters provides support via a video call to repair a device at a remote location. A technically skilled person, who does not have the necessary expert knowledge, is guided through the repair process by the connected remote support. The use of AR glasses is well suited for this purpose, as the local specialist can directly implement the instructions of the remote support and both participants can see the same thing.



Konkrete Anwendung von XR – Fallbeispiele

Zunächst wurden einige konkrete Fallbeispiele eingeführt, die eine sinnvolle Kombination von Anwendungsbereich und Technologie aufzeigen:

Remote-Support mit AR-Brille

Ein erfahrener Ingenieur am Hauptsitz des Unternehmens bietet über einen Video-Call Support zur Reparatur eines Geräts an einem entfernten Standort an. Dabei wird eine technisch versierte Fachkraft, die jedoch nicht über das nötige Expertenwissen verfügt, durch den zugeschalteten Remote-Support durch den Reparaturprozess begleitet. Die Nutzung einer AR-Brille bietet sich für diesen Einsatzzweck gut an, da die lokale Fachkraft die Instruktionen des Remote-Supports direkt umsetzen kann und beide Teilnehmende dasselbe sehen können. Durch die Möglichkeit, das Bild für die lokale Fachkraft im direkten Sichtfeld einblenden zu können, kann der Remote-Support nicht nur den Prozess und die nötigen Handlungsschritte beschreiben, sondern auch direkt für die lokale Fachkraft sichtbar machen.

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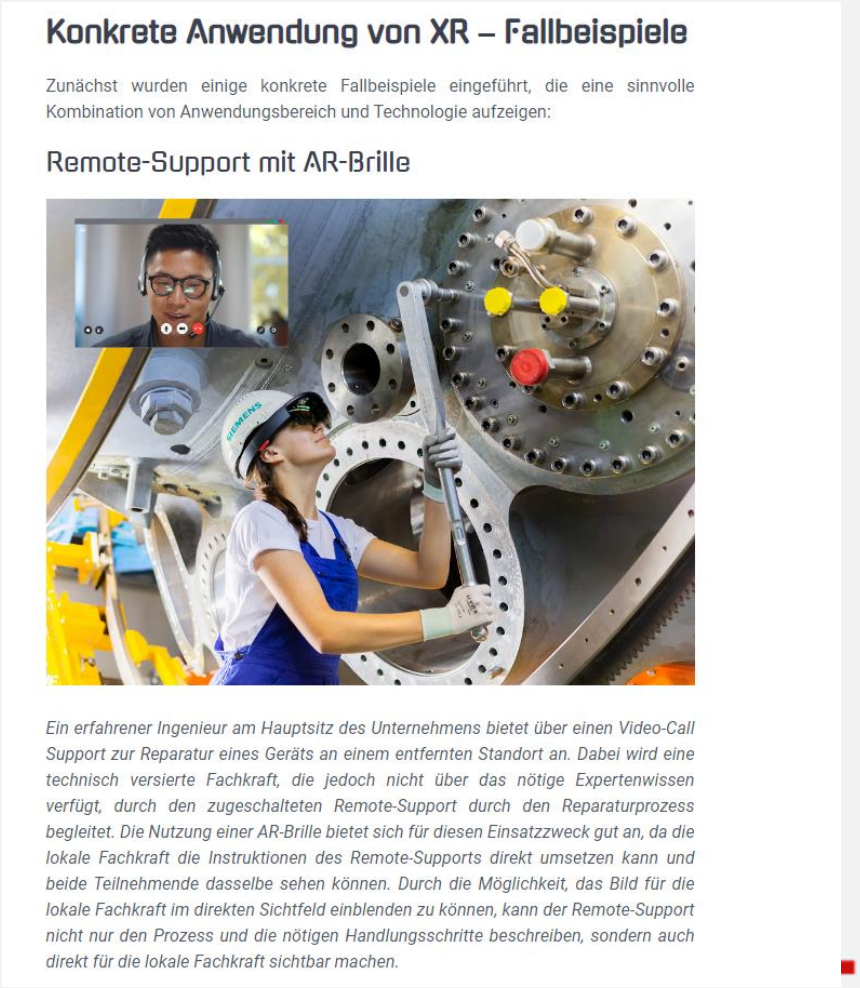

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Learning with AR/VR

Safety Training

A new skilled worker is to learn necessary safety measures, e.g. maintenance at great heights. Here, a VR headset is used to simulate the complete maintenance situation with the experience of the high position, the movement of the environment and the wind noise in the VR experience. The specialist practices the maintenance process in a safe environment, but under realistic environmental conditions. In case of errors, the skilled worker is protected and thus better prepared for the first real operation.

Interactive commissioning with AR on the tablet

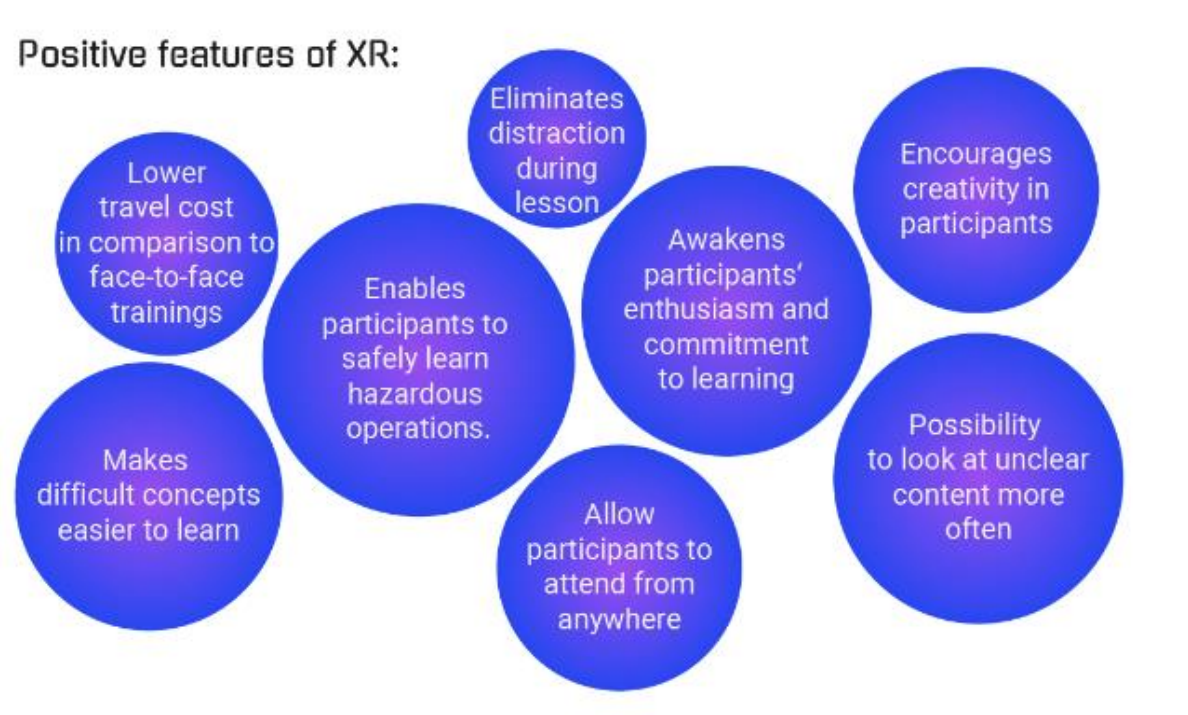
Sicherheitstraining mit VR-Headset

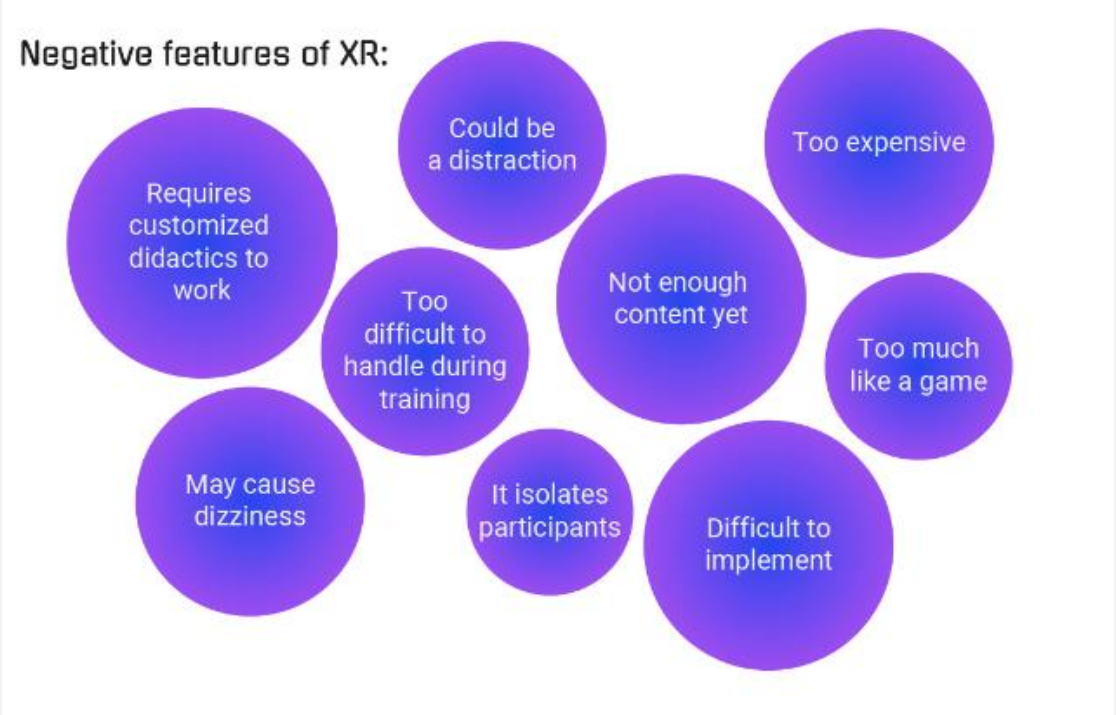
Eine neue Fachkraft soll notwendige Sicherheitsmaßnahmen erlernen, z.B. Wartung in großen Höhen. Hier wird der Fachkraft über ein VR-Headset die komplette Wartungssituationen mit dem Erleben des hohen eigenen Standpunkts, der Bewegung des Umfelds und der Windgeräusche im VR-Erlebnis simuliert. Die Fachkraft übt den Wartungsvorgang in einer sicheren Umgebung, aber unter realitätsnahen Umgebungsbedingungen. Bei Fehlern ist die Fachkraft geschützt und wird so besser auf den ersten realen Einsatz vorbereitet.

Interaktive Inbetriebnahme mit AR am Tablet

Pros and Cons for AR/VR

Augmented Reality / Virtual Reality = XR





Ref. VR- Repair Research Project with SIEMENS, Berlin University of Applied Sciences and Technology

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