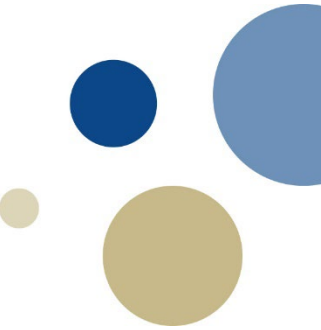


Bærekraft i elsys

Workshop 13.08.21

Introduksjon til prosjekt med Torstein

Spørsmålsrunde

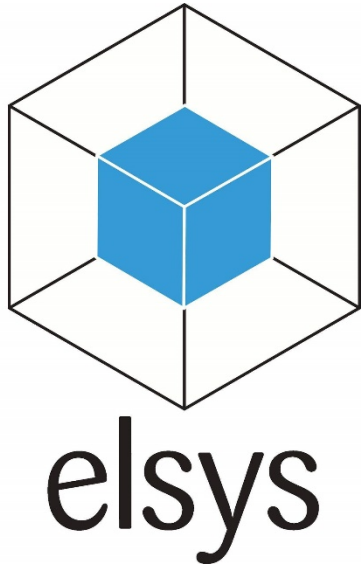


Hvordan definerer du bærekraft?



Hvorfor tenker du at det er det viktig å integrere dette i studieløpet?

FTS-pilotprosjekt: Bærekraft i høyere utdanning



Institutt for elektroniske systemer (IES)
Integrasjon av bærekraft i studieprogram



Verktøykasse - EHE toolkit (Verhulst & Van Doorselaer, 2015)

FREMTIDENS TEKNOLOGISTUDIER

Bærekraftkompetanse (Prinsipp I)

FTS Prinsipp I

*«NTNUs teknologistudier skal legge aktivt til rette for at kandidatene, med utgangspunkt i et solid faglig fundament, opparbeider helhetlig og integrert kompetanse, herunder **bærekraftkompetanse** og digital kompetanse på høyt nivå.»*

FTS' delrapport 3 [Visjon og anbefalte prinsipper](#) s. 4

EHE KIT

Ecodesign in higher education?

The EHE kit gets you started.

The work package 'Ecodesign in Higher Education' or EHE provides concrete guidance to teachers, professors, education coordinators and

Artikkel om verktøykasse: <https://www.sciencedirect.com/science/article/pii/S095965261500816>
Selve verktøykasse online: <https://ecodesign.vlaanderen-circulair.be/en/tools/ehe-kit>



Journal of Cleaner Production 108 (2015) 772–783

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Development of a hands-on toolkit to support integration of ecodesign in engineering programmes

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ARTICLE INFO

Article history:
Received 24 February 2014
Received in revised form 2 May 2015
Accepted 17 June 2015
Available online 2 July 2015

Keywords:
Ecodesign integration
Higher education
Toolkit
Engineering programmes
Curriculum

ABSTRACT

In recent years, the integration of sustainable development in higher education has received a growing amount of attention. During the last decade, initiatives have aimed at integrating sustainable development at higher education on various levels including education, research, outreach and operations. A limited, but growing number of initiatives focus on the educational level, especially regarding the integration of sustainable development in the curriculum. This growing attention results partially from the increasing pressure from industry on higher education that demands that universities prepare their graduates in education on sustainable development. This pressure has become an important driver for teaching staff to be more involved in the integration of the different aspects of sustainable development in the curriculum and courses of their educational programme. However, the number of studies that focus on the role of academic staff in the transformation towards education for sustainable development is limited. Even more, literature indicates that there is a strong need for methods and tools that can support educational staff in integrating sustainable development in curricula in higher education. This article presents a toolkit, the *Ecodesign in Higher Education-kit*, that fulfils this need by imparting available knowledge regarding sustainable development – and more specifically ecodesign – into the curriculum of higher engineering education. Ecodesign is considered a promising approach to sustainable production and consumption and is highly relevant for engineering education. Engineering education plays a critical role towards sustainable transformations.

The article presents the development process of the toolkit itself, as well as the conceptualisation, materialisation and application of the tool. Application of the toolkit in several design and engineering programmes in Belgium shows that the toolkit supports, activates and empowers teaching staff in the process of integrating ecodesign in the curriculum. Other strengths of the tool include its ability to create connectedness between teaching staff as well as social learning and a raised awareness on ecodesign issues. Opportunities for future development and research should focus on a further incorporation of competences for sustainable development, assessment of ecodesign in the curriculum, a broader view on the longitudinal integration process, and on the effect of the use of the toolkit on the integration of ecodesign in the curriculum.

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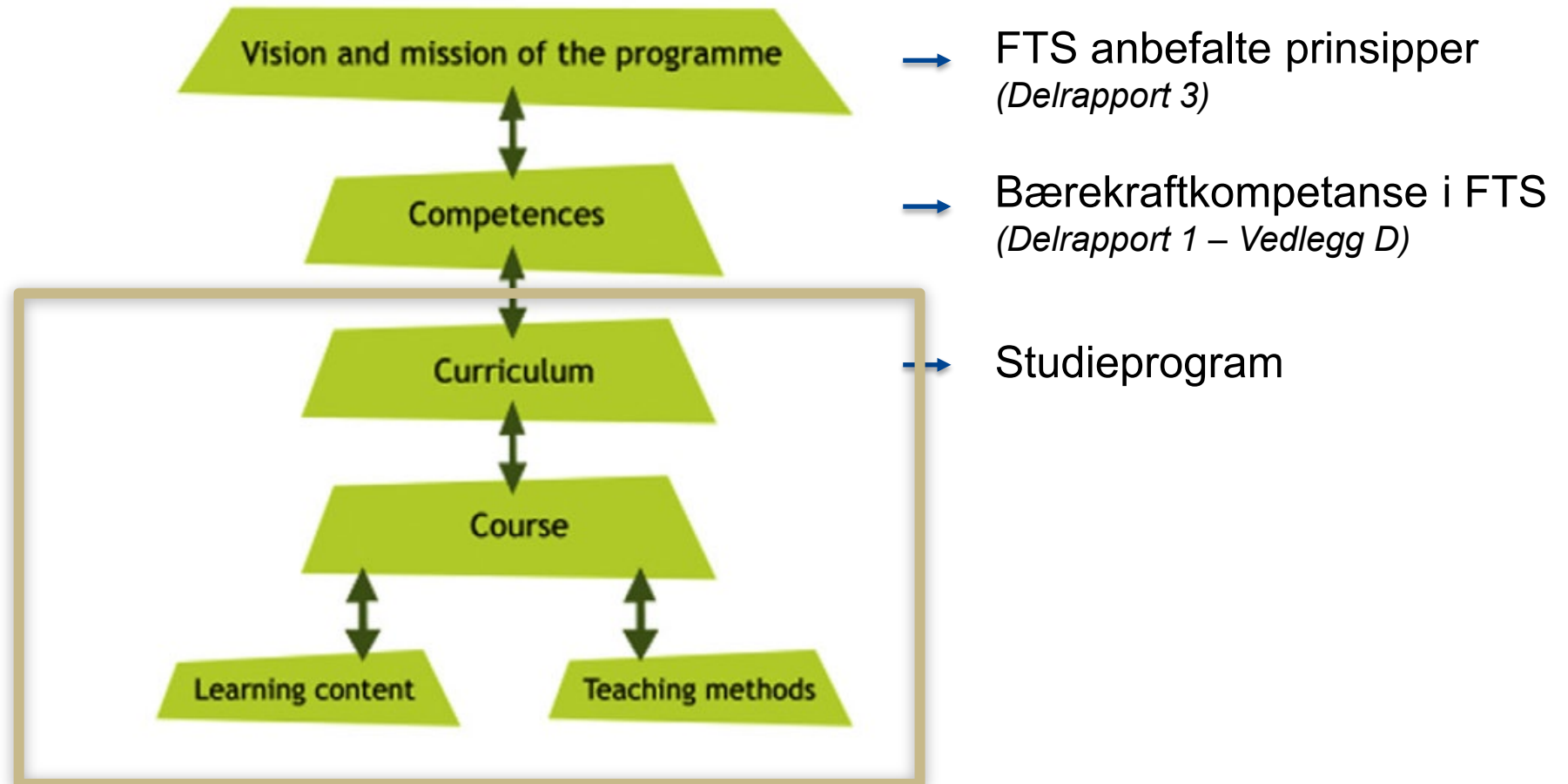
1. Introduction

In recent years, the integration of sustainable development (SD) in higher education has received a growing amount of attention. Available literature indicates a strong need for more support of educational staff in the integration of SD in the curricula of higher

educational institutes (HEIs). Numerous tools and methods that can support the integration of SD in higher education are discussed. However, tools that support the integration of SD in the curricula of engineering education with a focus on supporting teaching staff are difficult to find. This article presents a toolkit that has been developed with the aim to fulfil this need by imparting available knowledge on SD into a hands-on toolkit for teaching staff. More specifically, the toolkit focuses on the integration of ecodesign in the curriculum of engineering education in HEIs. It has been developed in and for the Flemish region (Belgium) but is available in English and can be applied elsewhere.

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Integrasjonsmodell for bærekraft i studieprogram



Metode EHE kit



Kartlegging av bærekraft i studieprogram

Hvor og hvordan til stede? Hva mangler?



Muligheter for videre integrasjon

Hvordan kan man synliggjøre, integrere og videreutvikle bærekraft i emner/studieprogrammet?

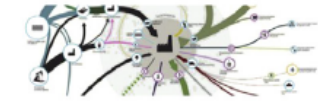
Metode EHE-kit



a Systems thinking

Complexity - Wicked problems

With systems thinking, one attempts to achieve and maintain an overview of the whole system instead of focusing on separate components without considering which role that part plays in the greater whole. The behaviour of a system - the bigger picture - is thereby considered as a relationship of interacting sub-systems in which feedback constantly occurs and plays an important role. The simple chain of cause-effect relations is thus abandoned. A holistic perspective is needed in order to be able to study a system by means of systems thinking. Systems thinking in itself is not a theory, method or technique, but rather a way of thinking in order to understand and be able to encompass the complexity of reality.



www.esoep.nl

Systems thinking often works on complex problems for which no simple solution can be found.

Various methods and techniques have indeed been developed that function as support for analysing patterns, connections and relations between the different elements of a system. They make it possible to investigate and understand a system holistically.

Sources and useful links

Bill Bryan, Michael Goodman & Jaap Schaveling (2006). Systems thinking. From: Academic Service. Presentation on wicked problems: issuu.com/shiftnl/docs/wicked_problems_intro_issuu

Practical example cards

EX. 5, EX. 6, EX. 10, EX. 11, EX. 12, EX. 17, EX. 25

LC.15

Learning content cards

c Product-service system + business model

Description of example

The students are divided into groups and each group analyses a product that could be reinforced by offering it in combination with a service. The students themselves select a product from their own environment. For instance, a TV, computer or lawnmower.

Brainstorming product-service systems: by means of a brainstorming session in small groups, they consider and discuss the possibilities and limitations of product-service combination. Based on the brainstorming session, they summarize these possibilities and limitations and examine specific design criteria: what must be adjusted and supplemented to the current product and the surrounding system in order to arrive at a successful product-service combination?

Brainstorming business models: by means of the business model canvas (available at www.businessmodel-generation.com/canvas), they link proposals for product-service combinations to possible business models. In doing so, the students must consider the various elements within the system for offering the product-service combination, and how these can fit within a company's business model. This brainstorming exercise also takes place in small groups.

The results are presented in class to the other groups, with the possibility of reflection and further discussion of the proposals.



EX.2

Practical example cards

d EX.2

Learning objectives

The students gain insight into the substantial aspect and the systematic overview of the product-service combination, as well as applying knowledge of business models.

Learning content

LC. 13 Product-service combinations, Sustainable business models

Prior knowledge and skills required

- Insight into business models: objective, content and approach
- Prior experience with brainstorming exercises can simplify the session, but are not necessary.

Result and evaluation

Results of the brainstorming session in the form of a broad spectrum of ideas for product-service combinations and the business models that they support in the form of a developed proposal for a product-service combination linked to a business model. Evaluation may occur on the basis of active participation in the workshop, although this is not always easy to monitor (depending on the size of the group). In addition, the students may also be asked to further develop (in group) one of the ideas from a brainstorming session: a product-service combination with an appropriate business model. The result is a group report containing the developed proposal for the idea selected. Students can be evaluated on this.

Teaching methods used

TM. 2 Brainstorming, TM. 3 Case method
TM. 6 Group work

b Demonstration

In a demonstration, the teacher demonstrates a certain activity or test and explains the various steps and components. Important in this regard are verbalising (oral presentation of activities), structuring and indicating matters to pay extra attention to.

A summary may follow the demonstration, possibly with preconditions (for example: when is something usable or not; when may one do something or not ...).

Of course, the students must be able to see the demonstration well; consequently, this teaching method is mainly appropriate for small groups.

The demonstration lasts 15 to 20 minutes. The teacher may of course ask questions to the students during the demonstration.



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Practical example cards

EX. 15, EX. 19

TM.4

Teaching method cards

Fig. 3. a. Example of an ecodesign theme – learning content card on 'system thinking', b. Example of a teaching method card 'demonstration'. c. Example of example card on 'product service system' (front). d. Example of example card on 'product service system' (back).

Aktiviteter i prosjektet

Konkretisering av FTS Prinsipp I

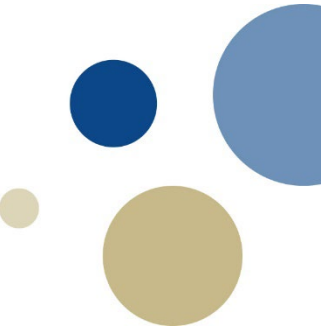
- Integrasjon av bærekraft i elsys gjennom bruk av metode EHE-kit
- Tilpasning verktøykasse til NTNU kontekst (FTS Prinsipp I)
- Oppdatering til bærekraft 2021
- Tilpassing og testing i studieprogram elsys

Muligheter for videreføring

- Verktøykasse og metode tilgjengelig til andre studieprogram for konkretisering av FTS Prinsipp I
- Eksempler og inspirasjon til hverandre

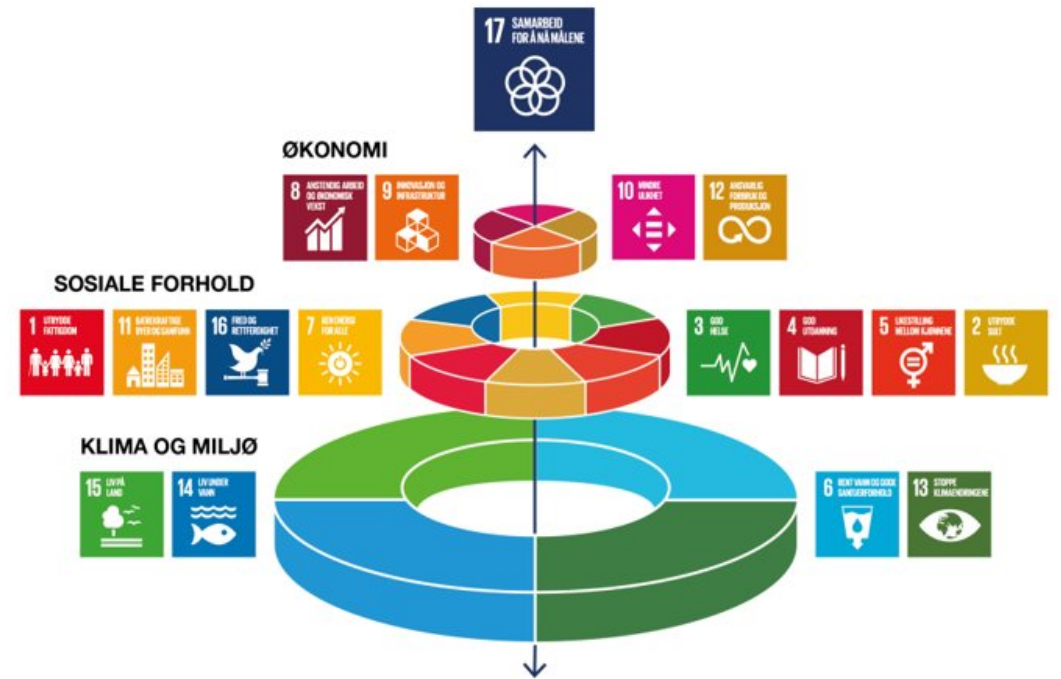
Dagsorden

Kl.	Hva
09:00	Introduksjon og brainstorming
10:00	Pause
10:10	Runde 1 gruppearbeid
10:50	Pause
11:00	Runde 2 gruppearbeid
11:35	Oppsummering
12:00	Avslutte



Bærekraft i utdanningen

- FNs bærekraftsmål og nye klimarapport



Studenters meninger



"Alle må bidra hvis vi skal ha et bærekraftig samfunn. Det er derfor viktig å starte fra utdannelsen for å kunne ta det med seg videre til arbeidslivet."

- elsys, 5. år

"Det er viktig for å så frø og idear hos studentane slik at dei ser korleis dei kan bruke utdanninga si til å forbetre løysingar som allereie eksisterer samt kome med nye idear som tar hensyn til bærekraft. I tillegg vil det skape større fokus og forståelse for kva bærekraft faktisk er, som kan overførast til andre utanfor studiet."

- kyb, 4. år

"Da vi driver med utvikling av fremtidens elektroniske systemer er bærekraftig utvikling svært viktig. Vi må være informerte systemdesignere som kan ta gode valg og utvikle uten negativ påvirkning på bl.a. klima og miljø."

- elsys, 4. år

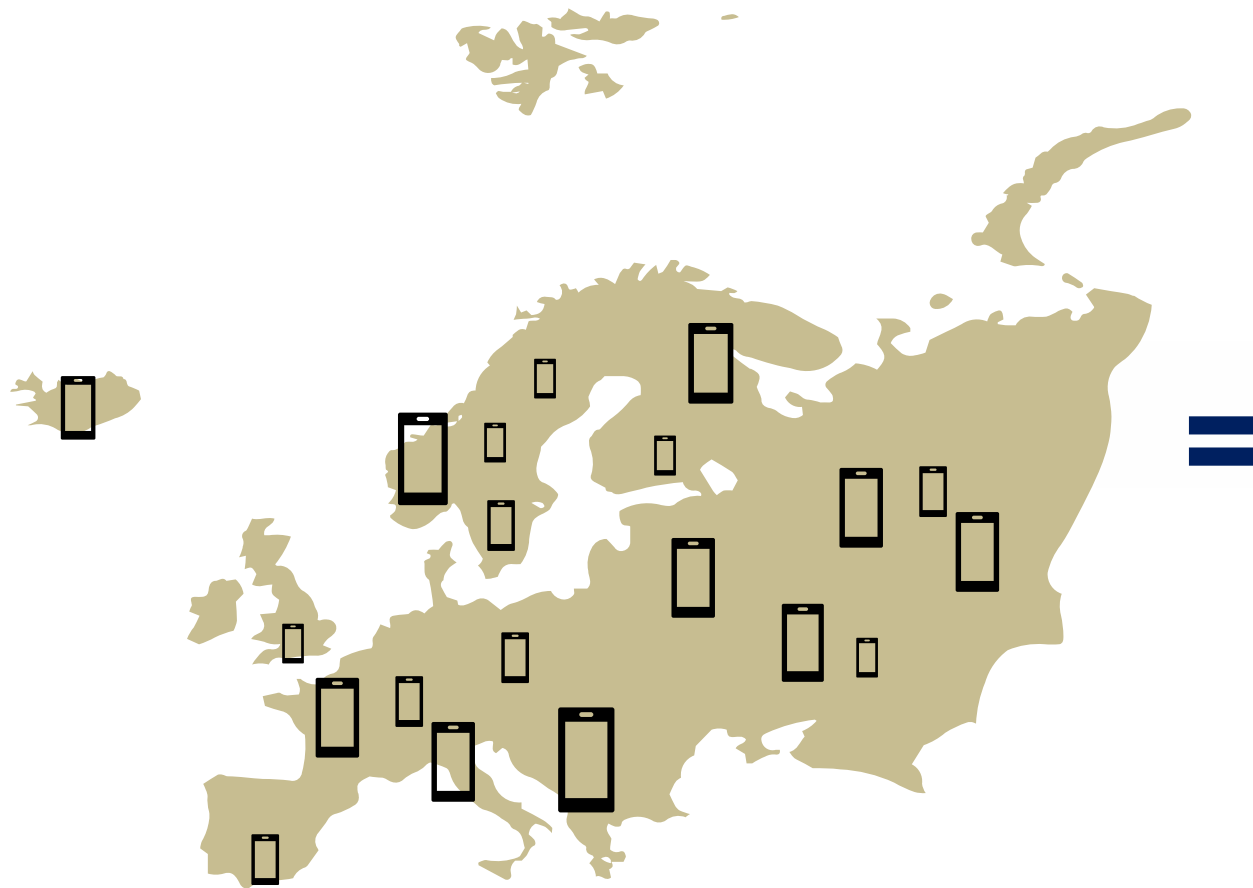
Elsys og bærekraft

The Sustainable Development Goals Report 2020



- Elsys – stadig i endring
- Studenter ved elsys er ubevviste

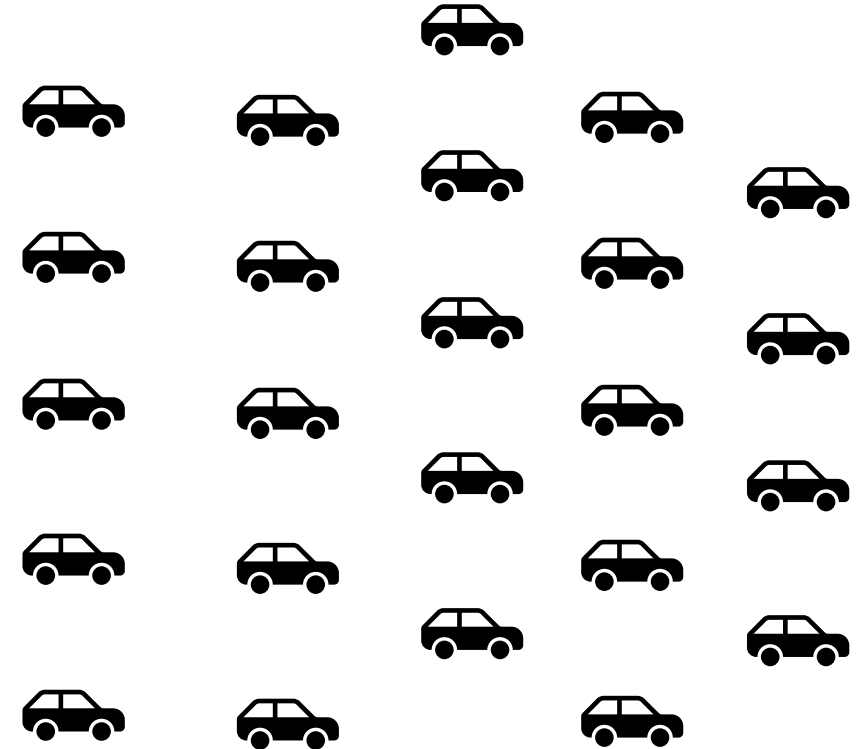
Elsys og bærekraft



1 år lengere bruk av mobilene

tilsvarer

at forbruket tilsvarende **1 million** fossilbiler på et år blir spart



Elsys + bærekraft = sant



Koronapandemien
og kommunikasjon



Målet med workshopen



HVA TENKER
FAGLÆRERE OM
BÆREKRAFT?



MOTIVERE DERE TIL Å
BIDRA



FÅ INNSPILL TIL VIDERE
ARBEID



TESTE WORKSHEETS OG
METODE TIL SENERE
WORKSHOP

Spørsmål



Hva mener du det er viktig å tenke på når man skal integrere bærekraft på elsys?



Hvordan kan ditt fagfelt bidra til undervisning om bærekraftig utvikling?

PAUSE 10 min til 10:05



Intro til gruppearbeid



Deler opp i grupper



To worksheets: Learning Content, Competences




Brainstorming av ideer til integrasjon




Oppsummering av delene

Spilleregler

- Velg tre emner fra elsys
- Gå gjennom alle *learning contents / competences* for hvert emne. Diskuter:
 - Hvilke er allerede integrert i faget, og på hvilken måte? (Rosa lapp)
 - Hvilke kan bli integrert i faget, og hvordan? (Gul lapp)
- Ingen begrensning på antall lapper eller farger per tema!



Rosa lapp =
integrert i
pensum i dag



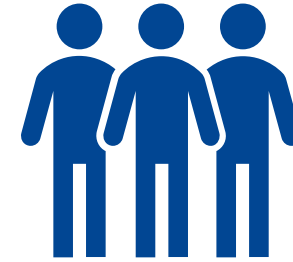
Gul lapp = kan
bli integrert i
pensum

Runde 1



Gruppe A: Learning Content

Torstein
Nils Rune
Lars
Astrid
Odd



Gruppe B: Competences

Elli
Geir
Thomas
Per Gunnar

PAUSE 10 min

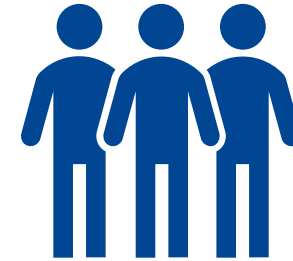


Runde 2 – Bytte



Gruppe A: Competences

Torstein
Nils Rune
Lars
Astrid
Odd



Gruppe B: Learning Content

Elli
Geir
Thomas
Per Gunnar

Oppsummering

Hva har gruppene kommet fram til?



Hva er det du tar med dere videre?

Skriv ned på post-it lapper
(3min)

Deling i plenum: 3 min per
gruppe

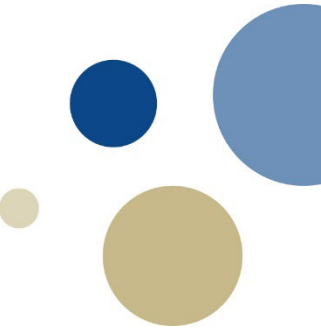
Tilbakemelding fra deltagerne



Vi hører gjerne deres tanker (skriv ned!) om bl.a.:

- Involvering av emneansvarlige
 - Gjennom workshop
 - På andre måter?
- Kobling emner fra studieprogram til
 - Bærekraftstema
 - Bærekraftskompetanse
- Kort fra verktøykasse
 - Bærekraftskompetanse
 - Learning contents

Veien videre



August

Videre utvikling av verktøykasse, inkl. workshop

6. September

Kick-off bærekraft på elsys

4. Oktober

Workshop bærekraft i elsys studieprogram

Hjertelig takk!

