

INCLUSION OF PREVENTION THROUGH DESIGN INTO ENGINEERING TEXTBOOKS

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Summary

- Introduction and Suffering!!!
- Inclusion of PtD into engineering textbooks
- PtD considerations in design process
- Implementation of PtD in design courses
- Textbooks (sold in other countries) containing PtD concepts may help to develop similar (common) concepts internationally
- Conclusions

Introduction and Suffering!!

Examples of PtD in each sector

Agriculture, Forestry & Fishing

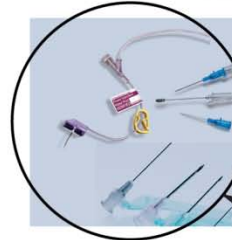


Preventing death and injuries with built in roll-over protection (1)



Preventing amputations by using an auto e-stop device on fishing boats (2)

Healthcare & Social Assistance



Preventing infection diseases in healthcare workers through safer sharps design (3)



Preventing back injuries with patient lifting devices (4)

Suffering

Construction



Preventing falls and fatalities with tie-in scaffolding (5)



Preventing exposures to asphalt fumes with emission controls (6)

Mining



Preventing back injuries with mechanical lifting devices (7)



Preventing hearing loss with a coated chain conveyor (8)

Transportation, Warehousing & Utilities



Preventing death and injuries transportation workers through vehicle design (9)



Preventing aircraft incidents by reducing work hours (10)

Wholesale & Retail Trade



Preventing injuries from falling merchandise using designs in rack-guard netting (11)

Services



Preventing electrocutions and falls with 3-dimensional roller arms (12)

Before Surgery NIOSH Project!!!



After Surgery



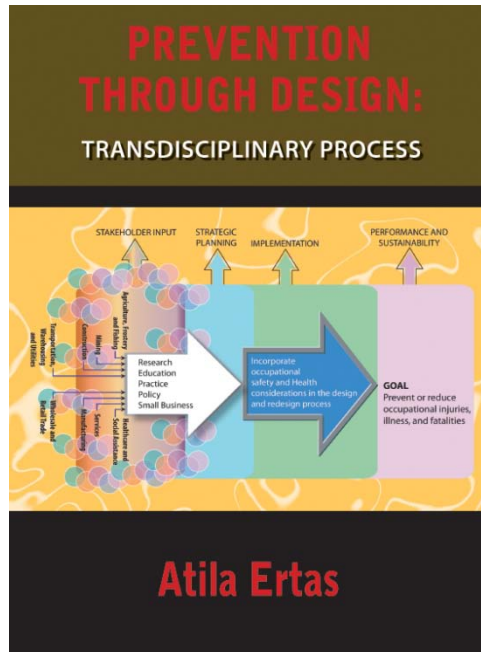
After Infection



Inclusion of PtD into Engineering Textbooks

- Prevention through Design: Transdisciplinary Process
- Engineering Mechanics and Design Applications: Transdisciplinary Engineering Fundamentals
- Transdisciplinarity: Bridging Natural Science, Social Science, Humanities and Engineering
- Transdisciplinary Engineering Design process
- Introduction to Engineering

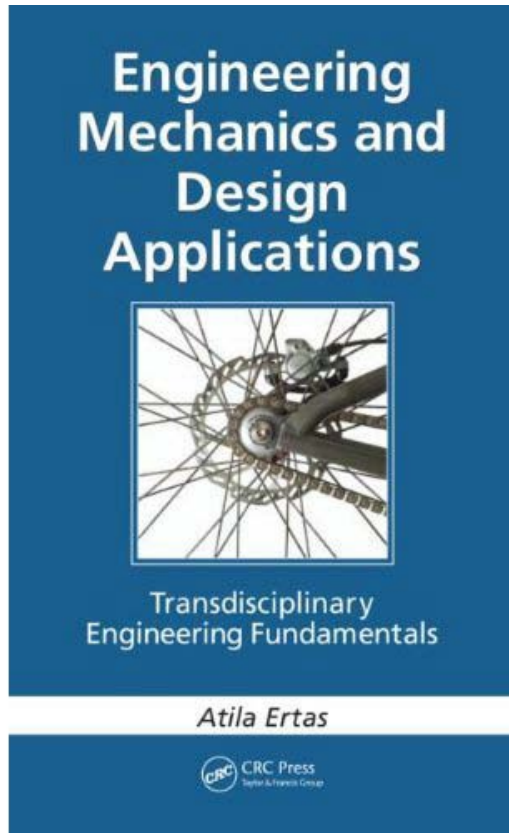
Inclusion of PtD into Engineering Textbooks



Prevention through Design: Transdisciplinary Process
(download from www.theatlas.org)

- Published by TheATLAS Publishing, 2010
- PtD concepts

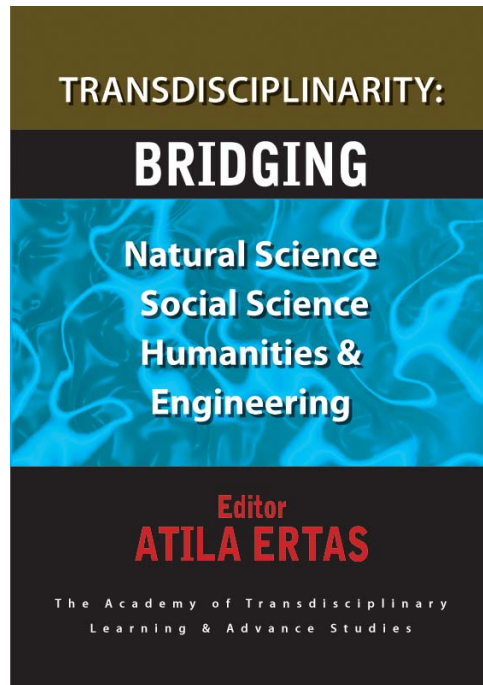
Inclusion of PtD into Engineering Textbooks



Engineering Mechanics and Design Applications:
Transdisciplinary Engineering Fundamentals

- Published by CRC Press, 2011
- Chapter 1... PtD concepts
- Chapter 6... PtD Design applications

Inclusion of PtD into Engineering Textbooks



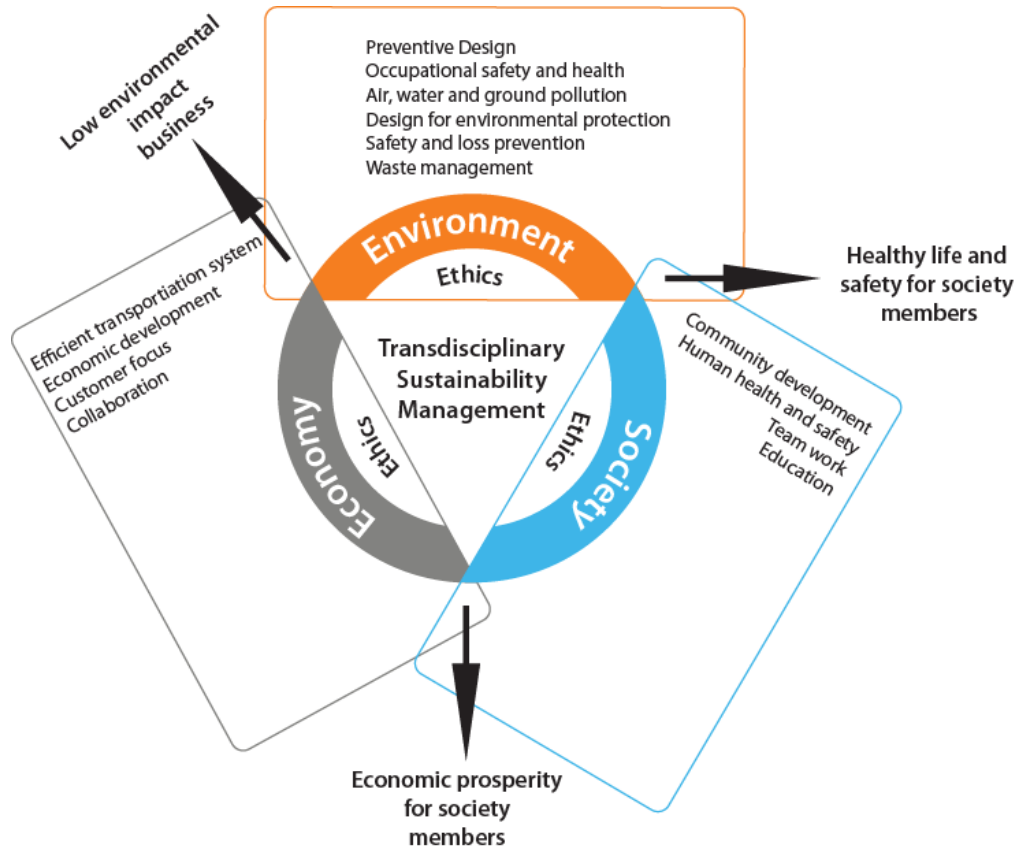
Transdisciplinarity: Bridging Natural Science, Social Science, Humanities and Engineering

- Published by TheATLAS Publishing, 2011
- Chapter 4... PtD concepts

Inclusion of PtD into Engineering Textbooks

Transdisciplinary Engineering Design process

- Will be published by **Wiley** (under review for contract)
- Chapter 6... Transdisciplinary Sustainable Design & Development



- 6.11 Prevention through Design (PtD)
 - 6.11.1 Introduction to PtD
 - 6.11.2 The Business Value of Prevention through Design
 - 6.11.3 Prevention through Design and Sustainability
 - 6.11.4 The Safety Engineer
 - 6.11.5 Prevention and Safety
 - 6.11.6 Safety and Loss Prevention
 - 6.11.7 Accident Prevention
 - 6.11.8 Case Studies

Textbook for Introduction to Engineering (IE) Course

Subjects in IE Textbook:

- excel;
- Mat lab applications,
- introducing disciplinary knowledge,
- creating hands on design project for computation,
- covering data collection and data presentation,
- Engineering Ethics, Communication, Team work, etc.

Teaching this course varies significantly from one engineering discipline to another.

Need

There is no acceptable common textbook for introduction to design course.

Textbook for Introduction to Engineering (IE) Course

Subjects in Introduction to Engineering Textbook:

- Since safety is priority in engineering applications, inclusion of PtD concepts in Introduction to Engineering textbook would be a great learning experience for the freshman students.
 - Students will learn what it takes to be a good engineer.
 - Students will learn critical Safety issues related to engineering design
 - They will learn and realize the consequences of unsafe design

Discussion

Textbook for Introduction to Engineering

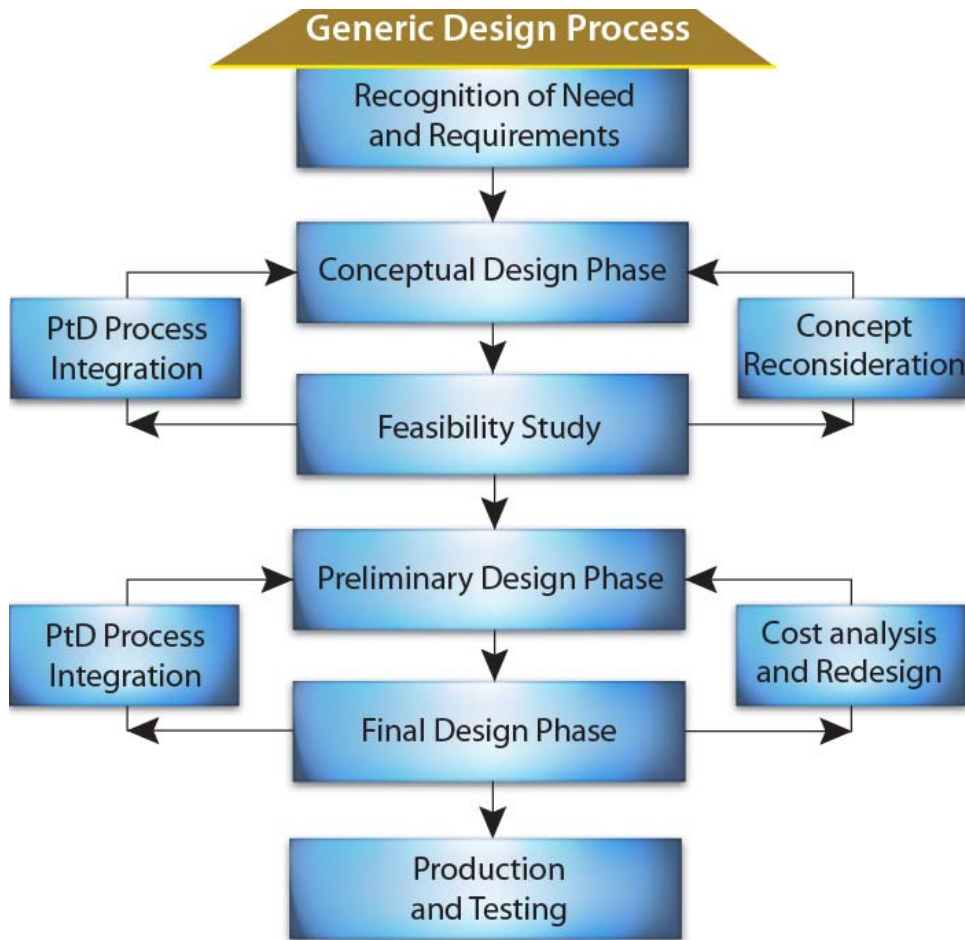
Table of Contents

- History and future of engineering
- Engineering fields of specialization
- Prevention through design and case studies
- Engineering design process
- Creativity and creative Process
- Concept development
- Principles of collaboration
- Communication skills (oral, written and visual)
- Team work and building teamwork skills
- Engineering ethics
- Understand the tools used in engineering
- Introduction to MATLAB (mathematical and scientific principles to the solution of practical problems)
- Analysis of experimental data

PtD Concept Throughout Engineering Curriculum

Pt.D concept is important for all the engineering disciplines and it should be integrated across the curriculum (ABET Design Applications)).

PtD considerations in Design Process



Generic Design Process

PtD must be fully integrated in the early design process in the project.

The main objective of PtD at the conceptual design phase is to evaluate alternative design concepts, to plan to protect workers safety and health from hazards and to provide a conservative safety design basis for a chosen concept to carry on into preliminary design.

The conceptual design phase offers a key prospect for the safety and health hazard analysis to influence the product design.

PtD considerations in Design Process

- **Preliminary Design Phase:**

When the hazard analysis is developed, the selection of controls, safety considerations, and classifications developed during the conceptual design phase must be revisited to make sure they are still appropriate. Decisions made during the preliminary design phase provide the basis for the approach to detailed design and production.

- **Detailed Design Phase:**

During the detailed design phase based on hazards and accident analysis of the final design, a final set of hazard controls will be developed.

Implementation of PtD in Design Courses

- **Hall Pump Design**
Compact reciprocating piston pump used for pressurizing water in fan misting system for evaporative cooling system. ***PtD consideration:***high pressure up to 1000 psi was consideration
- **Horizontal Shaker Table**
PtD consideration: Design project “shaker table” was very heavy, needed to be handled with extreme care and accuracy...
- **Hip Rehabilitation: Abdominal Muscles**
PtD consideration: sharp edges and corners were grinded; Open ends of the aluminum box tubing, square caps were manufactured by wrapping plastic in excess vinyl etc.
- **Hip Rehabilitation: Hip Muscles**
PtD consideration: sharp edges and corners were grinded; Open ends of the aluminum box tubing, square caps were manufactured by wrapping plastic in excess vinyl etc.
- **Percutaneous Annuloplasty for Mitral Valve Repair**

Work-Related Injuries are Real, Devastating, and Common

Textbooks (sold in other countries) containing PtD concepts may help to develop similar (common) concepts internationally

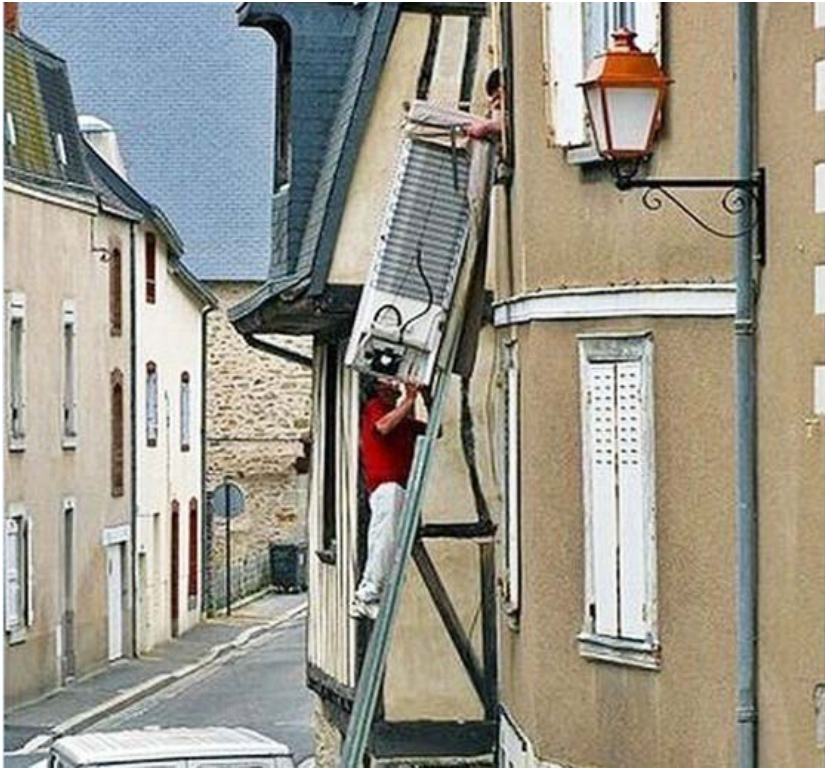
Work-related injuries are real, devastating, and common



Work-related injuries are real, devastating, and common



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Work-related injuries are real, devastating, and common



Conclusions

- PtD should be introduced to students at the freshman level
- PtD must be fully integrated in the early design process in the project
- Work-related injuries are real, devastating, and common. Can we help to other countries in developing similar, common PtD concepts