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Social Simulations Teach Engineering Student to Gain 'Buy-In' for Human Factors

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Social Simulations Teach Engineering Students to Gain 'Buy-In' for Human Factors

Neumann, W.P. and Rosen, R.

This presentation describes social skill development of undergraduate industrial engineering students using 'social simulations' in which students interact with trained actors in a designed social scenario. We present the example scenario of a young engineer who must gain buy in from industrial personnel to apply human factors (HF) in production system design. This experiential learning activity was designed with the Interpersonal Skills Teaching Centre at Ryerson University, in response to research evidence that training engineers in HF science alone is ineffective if the organisational environment and culture do not 'buy-in' to available benefits. The simulation is enacted by 3 actor/simulators in 2 scenes. They represent the plant manager, human resources manager, union representative, maintenance manager, purchasing agent, and production supervisor for a small manufacturing plant. Students take turns being engineers from head office who have been sent to help design a new production system for improved performance and reduced injury using HF principles. Students must address the concerns of each of the plant's stakeholders to gain buy-in for this new approach for production development. This presentation will present and discuss the methodology and evaluation options for this technique for teaching social skills to engineering students.

Social Simulations Teach Engineering Students to Gain 'Buy-In' for Human Factors

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RYERSON UNIVERSITY

Teaching Objectives

- Engineers need stronger social skills
  - Modern, multi-stakeholder design teams
- Ergonomics needs to be applied early in design where costs are lowest and benefits greatest

Interpersonal Simulations

- Professional Actors
- Designed Scenario (set roles not scripts)
- Students interact with characters in the scenario
  - NOT role-playing (students are engineers)
- Actors and Facilitator provide feedback on interaction quality (social skills)

Interpersonal Simulations...

- 'Experiential Learning' modality
  - Makes links between theory and practice
- Enhance communication skills
- Increasingly used
- Provide graduates with career skills
- Many disciplines across universities
- Are both educational and FUN

Experiential Learning

- Experiential learning: "involves the whole person in experiencing by simulation….. that which happens in the real world" (Downs 1992).
- Simulation can help make continuous linkages between theory and practice (Kates 1994)

Evidence of Effectiveness

- Experiential learning improves grades for Construction Engineering students who are open to it
  - (Lee, McCullough and Chang, 2008).
- Simulations enlivens the classroom and enhanced the learning experience
  - (Lantis, 1998)

Ergonomics Agenda

- Work related illness and injury
  - 4% World GDP (WHO)
  - Costs ~= all cancer combined
- Poor Ergonomics associated with
  - Injury
  - Quality
  - Performance losses
  - Intangible losses (commitment, moral)
- Ergonomics needed in design – no retrofitting

Research Evidence (Broberg et al. 1997, 2007)

- Engineers lack of knowledge limits application of ergonomics
- Training engineers in ergonomics alone is not sufficient
  - New knowledge does not get used
  - Managers don't require it

Solution? Trained engineers need to be able to argue effectively for apply ergonomics into design processes

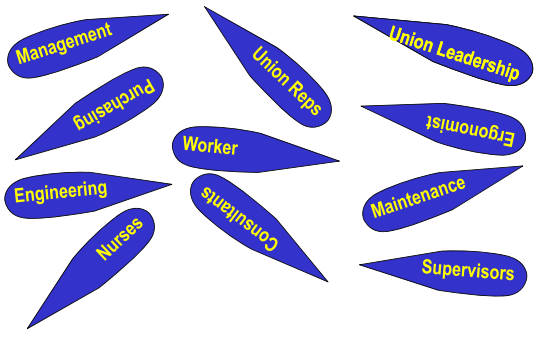
Teaching Scenario

- Developed based on past professional and research experience
  - Roles and relationships in ergo (Neumann et. al, 1999)
  - Auto parts sector (Canada & Sweden)
  - Electronics sector (Canada & Sweden
  - Discussions with ergonomists world-wide
- Developed in cooperation with Ryerson's Interpersonal Skills Teaching Centre

The Scenario: Gaining Buy in for HF

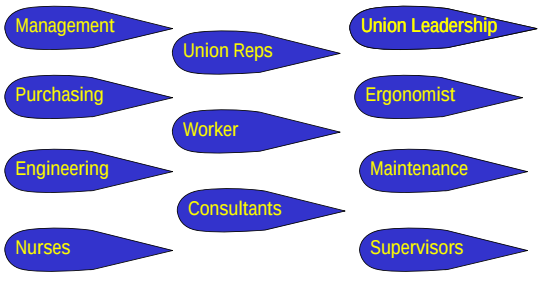
- Opportunity: A company with rocky safety and production record is to build a new product
- VP (head office) wants HF included in the approach
- Students (Engineers from HO) are to meet with plant personnel, engage them in process which is to include HF in design from the start

Roles / Goals in Ergonomics



Neumann et al. (ACE - 1999) Roles and Relationships…

Roles in Ergonomics



Neumann et al. (ACE - 1999) Roles and Relationships…

2 Scenes 1 Goal: Get buy-in for ergo in design

- Scene 1:
  - Starts with plant manager
  - Adds HR and Engineering managers
    - Arrive late, not prepared, not aware
- Scene 2:
  - Starts with Line supervisor and Union Rep
  - Adds Purchasing manager
    - Arrives late, does not understand why invited

Simulation

- 2 students led meetings
  - Interact with characters naturally
  - 'Time-Out' if uncertain how to proceed
    - Actors will 'go neutral'
    - Facilitator can discuss with class and/or Swap in a new pair of students
  - Action proceeds with 'Time-In'
- Feedback from 'simulators' at the end

Simulator/Actor Roles

- Simulators instructed to:
  - Not understand 'ergonomics'
  - Respond to reasonable explanations
  - Respond to appeals to their interest
    - Managers want smooth productivity low errors
    - HR & Union want no injuries
    - Supervisor wants no absenteeism
    - Maintenance wants no equipment damage
  - Provide feeback on interpersonal skills
    - Body and verbal communication

Discussion

- How can young engineers who have not been in the workplace relate to these situations?
- Argumentation needs preparation
  - Need ready response to standard blockers

Discussion Conclusions

- Social Simulation shows good potential for training new engineers to argue effectively for human factors (ergonomics)
- Students report a positive experience...
- Real benefits may only appear much later in professional life
- Evaluation of the approach?

Thank you

- Questions?
- Suggestions?
- Form more information>
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