Students (intrinsic) motivation, learning outcomes and gains

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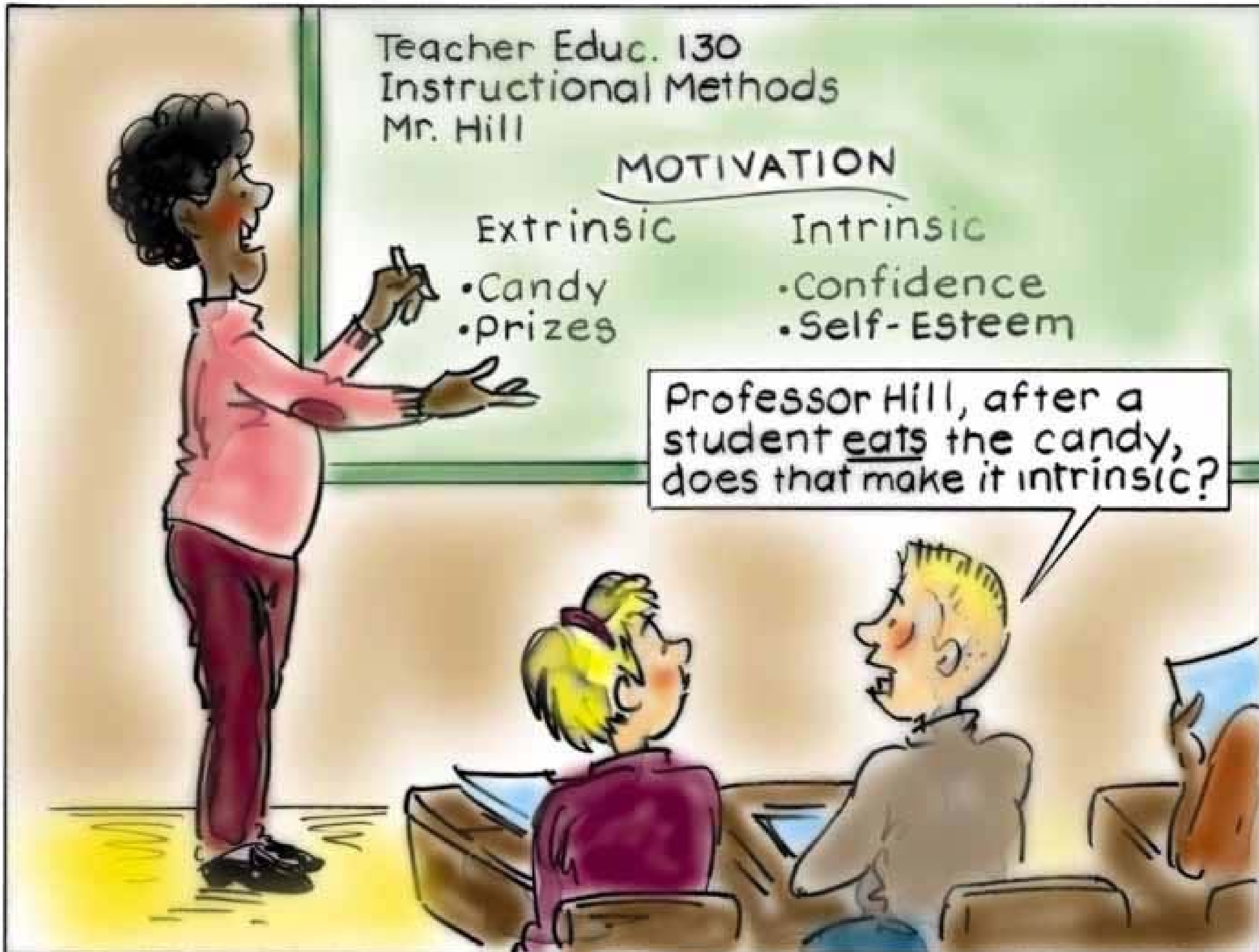
What is motivation?

- A force to move
- An internal state that arouses, directs and sustains behaviour towards a goal

Self Determination Theory (SDT; Deci & Ryan, 1985)

- Extrinsic Motivation (External): Prods, pressures rewards
  - Students learn because learning is a means for another goal
- Intrinsic Motivation: (Internal) FUN
  - Students learn for its own sake
  - Enjoy learning


Teacher Educ. 130
Instructional Methods
Mr. Hill
MOTIVATION
Extrinsic
•Candy
•Prizes
Intrinsic
•Confidence
•Self-Esteem
Professor Hill, after a student eats the candy, does that make it intrinsic?

Why deal with motivation in science teaching?

- **The need for lifelong study of science:**
  - Students should realize the relevance of science and technology to their lives and willingly continue their science study in school or beyond school (National Research Council, 1996).
- **Motivation enhances learning:**

  Students' motivation has been found as playing an important role in their conceptual change processes, critical thinking, learning strategies and science learning achievement (Lee 1989, Lee and Brophy 1996, Pintrich et al. 1993, Napier and Riley 1985, Garcia and Pintrich 1992, Kuyper et al. 2000, Wolters 1999).

- **Does motivation enhance learning or advanced students are highly motivated because they are successful in doing so?**
- Results suggest that motivation and cognition are reciprocally related over time.(Young, 1997)

Motivation and school life..

Students begin school with enthousiasm but….

Gradually settle into dull routine…

Motivation and Science education

- **Students are unwilling to work hard toward achieving scientific understanding** : they spend their time and effort focusing on memorizing science vocabulary or factual information, mindlessly answering questions, copy answers from their texts or peers. (Barlia, 1999)
- **They are not really interest in science**:Interest centers on minimizing the ambiguity about precisely what must be done and risk (Brophy, Rohrkemper, Rashidfi Goldberger, 1983; Harter, 1981; Lepper, 1983)
- **Students' motivation toward science has been decreased after they enrolled in school** (Tuan & Chin, 2000),
- **Fewer people want to study Science:** In recent times fewer young people seem to be interested in science and technical subjects, whereas Science education is increasingly failing to engage young people with the further study of science. (Osborne and Dillon, 2008)

The goal

RECOMMENDATION 2 :

"More attempts at innovative curricula and ways of organising the teaching of science that address the issue of ***low student motivation*** *are required.*

These innovations need to be evaluated. In particular, a physical science curriculum that specifically focuses on developing an understanding of science in contexts that are known to interest girls should be developed and trialled within the EU."

Osborne and Dillon, (2008), Science Education in Europe, Critical reflections.

What factors affect students' motivation?

- **Self-efficacy:** the pupil's judgment about being able to perform a particular activity
  - influences the power a person actually has to face challenges

    Influences the choices is most likely to make

- **Self - regulated learning: (**autonomous learning, self-planned learning, self-education **)**The degree to which individuals are active participants in their own learning
  - Students' belief that their efforts to learn will result in positive outcomes, if students believe that their efforts to study make a difference in their learning they should be more likely to study more strategically and effectively. (Garcia et al, 1991)

What factors affect students' motivation?

- **Test Anxiety: cognitive and emotionally component**
  - Cognitive component: students' negative thoughts that disrupt performance
  - Emotionally component: affective and physiological arousal aspects of anxiety
- Cognitive concern and obsession with performance have been found to be the greatest sources of performance decrement. (Garcia et al., 1991).
- Text anxious students performed poorly and were less motivated when exposed to highly evaluative classrooms (Hancock, 2002)

Question: Is text anxiety irrelevant to self efficacy?

What factors affect students' motivation?

- **Goal orientation**: their personal goals when engaged in learning
  - Learning goals : students perceive themselves to be participating in a task for reasons such as challenge, curiosity, and mastery (Garcia, McKeachie, Pintrich, & Smith, 1991).
  - Performance goals tend to be extrinsically motivated, seeking to earn the highest grades and impress their instructors (Cavallo, Rozman, Blinkenstaff, & Walker,2003).

- **Task value: how interesting, how important, and how useful the task is.** (Garcia et al., 1991).
  - Students perceived task value/usefulness increases students motivation (Artino, 2008; Xie et al., 2006; Schmidt & Watanabe, 2001; Dörnyei & Csizér, 1998; Tremblay & Gardner, 1995; Dörnyei, 1994; Oxford & Shearin, 1994)
  - Perceived value emerges from personal "self" that needs something. (Kasser, 2002)

So, what we mean when we seek for motivated students?

- "Student's tendency to find academic activities meaningful and worthwhile and to try to derive the intended academic benefits from them" (Brophy,1988)

- "Students to perceive that they are capable, and they think the conceptual change tasks are worthwhile to participate in, and their learning goal is to gain competence, in order to be willing to make a sustained effort and be engaged in making conceptual change." (Tuan et al, 2000 p.641)

Motivating Science Education?

- Promising Learning environments
- Constructivist approaches
  - If each learner individually and socially constructs meaning as he/she learns, then he/she does not passively absorb information but rather, is engaged in meaningful learning by actively creating and modifying his/her knowledge structures (Palmer, 2005).
  - Students set and pursue goals for themselves and give them some degree of control over what they learn and how they learn it
  - Goal orientation, task value (meaningful), self-regulated learning aspects of motivation.

IBSE as constructionist and as motivating

- Inquiry Based Science Education

  - **Engagement:** A learning process in which students are **engaged** (Anderson, 2002), A**n active learning process**: "something that students do, not something that is done to them" (National Science Education Standards, NRC, 1996, p.21).
  - **Autheniticity:** An authentic scientific practice, a valuable context for science learning.
  - **Emotional Safety:** A group /community process which alleviates and motivates the introverted student : Individual performance based tasks can often lead to embarrassment, fear, and dread (MacIver et al., 2001)

Self efficacy , self regulated learning, meaningful –interesting tasks, low anxiety: A promising teaching method for motivation

Evidence regarding IBSE and motivation

- After inquiry instruction students' motivation increased significantly than students who enrolled in traditional teaching. (Tuan et al, 2005,Profiles Cyprus, 2012)

- Educators who collaborate with students in guided scientific inquiry based lessons and activities increase student motivation (Crawford, 2000; MacIver et al., 2001; Marx et al., 2004; Holbrook & Kolodner, 2000).

IBSE is not a panacea for motivation

- Inquiry based learning had been difficult both with creating initial engagement and with maintaining engagement over the longer term.(Edelson et al, 1999)
- Decontextualizing inquiry investigations into discrete process skills prohibits synthesizing and elaborating scientific knowledge, as well as causing motivational problems. (Metz, 1995)
- Without motivation or understanding of why they are collecting data, children may not strive to produce clear results. (Duggan et al, 1996)
- Some students perceive the group work as demotivating when they struggle to cooperate with their peers, or fail to come to a common plan or decision (Evagorou, Lymbouridou and Nicolaou, 2012)

Motivating science? Relevant Science

- Problem solving and the relevance of science knowledge in students' daily lives are included among others as unique features that highlight the value of science learning. (American Association for the Advancement of Science 1993, NRC 1996).
- The utility dimension
  - The utility dimension: From everyday to science, or from science to everyday
  - Relevance: interesting, useful and worthwile (electric circuits in my life, acids and bases in the drinks I drink, big shoes for increasing friction in the ice)

Problems with utility: mankind had used fire long before scientists discovered thermodynamics…

- Problem solving includes many factors beyond the scientific knowledge behind the problem (ie Simon's carbet problem example) Focusing on the scientific aspect requires specific pedagogical decisions and skills
- There is a challenge to find the right balance between a "broad intellectual understanding of the natural world and the scientific way of thinking on the one hand, and the utility of science for effective living on the other"(de Boer, 2000)
- Explanations and solutions : Everyday problems need prescriptions for actions but not always those prescriptions are related to explanations of why those actions should be taken. HOW and WHY
- Science and technology differ as disciplines: Explain electricity and fix my broken electric car require different cognitive processes even though one process might feed the other

Socioscientific issues as a motivational context

- *"A controversial issue is an issue about which there is no one fixed or universally held point of view. Such issues are those which commonly divide society and for which **significant groups** offer conflicting explanations and solutions." (Crick Report, 1988 p.58)*
- The resolution of SSI creates a link between learning in science and real life
  - Students need to understand scientific concepts related to contemporary controversies that affect their lives
  - They conceptualize the nature of science as a human enterprise that produces entities that affect the natural environment, their health and the social in general.

SSI challenges

- SSI discussion infuses other areas in science lessons, as different social domains impinge upon the decision making: religion, science, ethics, politics, law and others (Aikenhead, 1985).
  - We should find a pathway to give the science part of the socio –scientific
- SSI is about a decision to be made; an action to be taken (to clone or not to clone, to consume aspartame or not)
  - Practical reasoning as opposed to theoretical reasoning : emotions, volitions and cognition in making decisions
  - Values, desires and passions
    - We should find the way to promote thoughtful decision making with respecting the child's emotive belief systems, or his presence as a moral agent.
    - We need their emotions to raise interest but how do we act when those emotions interfere with scientific evidence either ignoring it or distorting it to assimilate current beliefs and desires?

SSI challenges

- Children might be motivated by the authenticity of the task but research suggests that
  - **They might be dissappointed** from the ill-structured nature of the problems (Evagorou et al, 2012)
  - **They might feel fear or panic** because of the consequences for ie their health related to the issue under discussion. (Lymbouridou, 2011) "*Are we going to die from cancer because using mobile phones?*"
  - **They are emotionally engaged in situations** *«I would not like to clone my dead mother and watch her dying from the same illness twice»*
  - They even feel sadness because their environment is so complex and they can not reach a "right" solution to "fix" the problem (Evagorou et al, 2012)

Are SSI motivating or frustrating for young students?
What does developmental psychology say about this?

Thanks for your attention!!!

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