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Self-confidence: An Introduction to the Literature and Related Constructs

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Beliefs, Attitudes, Intention and Behaviour

Fishbein and Ajzen (1975, p.6)

Suggest a **Causal Chain**

Beliefs (link an object with an attribute/characteristic)

→ **Attitudes** (a learned predisposition to react favourably or unfavourably with respect to a given object)

→ **Intentions**

→ **Behaviour**

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Beliefs, Attitudes and Emotions

Pehkonen and Pietilä (2004)

- **Hot – Emotions**
  - can change very quickly
- **Cool – Attitudes**
  - slower to form and change
  - a repeated emotion can form into an attitude
- **Cold – Beliefs**
  - slow to form and change
  - can be deeply held
  - greatest level of cognitive involvement

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Affect in Mathematics

- **Beliefs**
  - Self-confidence, Self-efficacy, Self-concept
  - Mathematics is difficult
  - Mathematics is useful
- **Attitudes**
  - Liking of Mathematics
  - Interest in Mathematics
- **Emotions**
  - Mathematics Anxiety
  - Enjoyment

(**Affect excludes motivation,** Eynde *et al.*, 2006)

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Motivation

- **Attribution Theory**
  - What a person *attributes* success or failure to will influence motivation. e.g. Whether considers success is the result of hard work (motivates) or by natural ability.
- **Goal Theory**
  - Distal vs. proximal goals
  - Level of specificity
  - Challenge - sufficient challenge, not unrealistically demanding
- **Expectancy-Value Theories**
  - What an individual expects a particular action will achieve
  - How much the person values the outcome

Bandura, 1997

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1970s - 1980s Mathematics Attitude, Anxiety and Self-efficacy Scales

- Aiken, 1974 – Created two scales: Enjoyment of Mathematics and Value of Mathematics.
- Fennema and Sherman (1978) – Mathematics Attitudes Scales – 9 subscales.
- Many found gender differences: no differences in early school, but significant difference by high school and college giving males the advantage in achievement and, particularly, self-efficacy.
- Richardson and Suinn (1980) – Mathematics Anxiety Rating Scale, **MARS**
- Betz and Hackett (1983) - Mathematics Self-Efficacy Scale, **MSES**

Scales tended to be very long and time consuming

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Mathematics Attitudes

- Past use of ‘Attitude’ was a wider term
- e.g. Sandman (1980) Mathematics Attitude Inventory, MAI, comprised 6 subscales:
  - Perception of Mathematics Teacher
  - Mathematics Anxiety
  - Value of Mathematics in Society
  - Mathematics Self-concept
  - Enjoyment
  - Motivation
- Which of these sub-scales refer to an attitude?

- McLeod, 1992 – Divided Affect into Beliefs, Attitudes and Emotions

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Self-efficacy, Self-confidence and Self-concept

- Bandura defined perceived **Self-efficacy** as

'*a belief about what one can do under different sets of conditions with whatever skills one possesses'*

Bandura, 1997, p.38

- **Self-confidence** - equivalent to self-efficacy. 3 domains: Overall, Topic and Applications (Parsons *et al.*, 2009)
- **Self-concept -** more complex cognitive and affective construct involving measure of self-worth (Pajares and Miller, 1994, Bong and Clark, 1999)
- Empirical distinction between self-efficacy and self-concept (Lent *et al.*, 1997, Bong and Skaalvick, 2003, Ferla *et al.*, 2009)

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Bandura's Four Sources of Self-efficacy

- Enactive Mastery Experiences
  - Past success or failure
- Vicarious Experiences
  - Comparison with peers or similar persons and circumstances
- Verbal Persuasion
  - When *significant* others say you can succeed
- Physiological and Affective states
  - e.g. racing heart beat would indicate a lack of self-efficacy

Bandura, 1997

Bandura's Four Mediating Processes for Self-efficacy

- Cognitive processes
  - Higher self-efficacious individuals tackle more difficult tasks and persevere longer
- Motivational processes
  - Influence a persons' reasons for and willingness to do certain actions
- Selective processes
  - Especially important for young people as choices may affect career and rest of their life
- Affective states

Bandura, 1997

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Studies I

- Frid *et al.*, 1997- Investigated student confidence in their maths background, course and lack of confidence (in Australia).
- Shaw and Shaw, 1997 and 1999 – Found clear links between mathematics achievement and attitudes of engineering students.
- Galbraith and Haines, 1998 and 2000, produced Mathematics-Computing Attitude Scales (in Australia). Also Cretchley and Galbraith, 2002 and Fogarty *et al.*, 2001.
- Armstrong and Croft, 1999 - Surveyed 1750 new engineering, science, technology and maths entrants for 40 topic confidences. They found many students lacked confidence in various topics which were identified for mathematics support.

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Studies II

- Fogarty *et al.*, 2001 - Mathematics and Technology Attitudes Scales – investigated the use of computers (MATLAB) for learning mathematics. Produced three scales (in Australia).
- Brown *et al.*, 2003 – Investigated Single Mathematics students in 2 UK universities. Found success did not equate with enjoyment, many successful students did not enjoy mathematics.
- Gordon, 2004 - Psychology Students – many students did not show interest or motivation for learning statistics. 73% would not have chosen to learn statistics.
- Burton, 2004 – Investigated understanding of confidence of Maths A level pupils ('can do' thoughts) and teachers (looked for behaviour like hands up)

Fogarty *et al.*, 2001 Mathematics Confidence Subscale

- Fogarty *et al.*, 2001 - Mathematics and Technology Attitudes Scales (adapted). 8 of 11 Items. 5 point Likert Scale responses.
- I have less trouble learning maths than other subjects
- When I meet a new maths problem I know I can handle it (adapted)
- I do not have a mathematical mind
- It takes me longer to understand mathematics than the average persons
- I have never felt myself able to learn mathematics
- I enjoy trying to solve new mathematics problems
- I find maths frightening …
- I find maths confusing

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Studies III

- Tapia and Marsh, 2004 - Attitudes Towards Learning Mathematics Inventory (ATMI) – 545 US secondary students.

  4 sub-scales (40 items, 10-20 minutes)

- Carmichael and Taylor, 2005 - Whilst there are clear links between knowledge, competency and self-efficacy and self-concept beliefs, there are also exceptions. Someone with low self-efficacy may be highly motivated, work hard and perform well

- Usher, 2007 and Usher and Pajares, 2009 - New Sources of Mathematics Self-efficacy Scale for middle school students (US). Samples sizes: N= 1111, 824, 803. Confirmed enactive mastery experiences as strongest predictor of self-efficacy

Studies IV

- Ferla *et al.*, 2009 - 8,796 Belgian School Children. Mathematics self-efficacy mediated effect of gender and past achievement on mathematics achievement. Self-concept self-efficacy distinction.
- Liu and Koirala, 2009, Found that mathematics self-efficacy was a significant positive predictor of achievement for 11,726 US high school students.
- Liston and O'Donoghue, 2009 – found significant correlations between first semester marks and mathematics self-concept and with mathematics enjoyment.
- Parsons *et al.*, 2009 – Found significant relationships and regression models for student achievement in mathematics using past qualifications and self-confidence as independent variables.

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Studies V

- Nunes, 2009 – Analysed primary school children data from Avon and found self-confidence is predicted by competence, and gender and ability group placed in. Attainment largely determined by cognitive and social factors, but also influenced by self-confidence.
- Williams and Williams, 2010 - Found relationships between self-efficacy and achievement in mathematics for 15 year olds in 33 nations.
- Pampaka and Wake, 2010 - Investigated change in Self-Efficacy for AS mathematics courses.
- TISME, 2013 – Aspires project found children 10-14 may be interested in science and like science, but do not pursue science as *don't think they are clever enough* (i.e. lack of confidence).

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References and Contact

Full references – can be supplied upon request

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Self-confidence in mathematics matters!

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