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CONTENTS

1. STUDENT EVALUATION OF TEACHING TODAY AND COGNITIVE BIASES

1.1. STUDENT EVALUATION OF TEACHING

Student evaluation of teaching (SET) is common in higher education, and involves the students rating their instructor(s) and/or the course, either globally or using specific characteristics (eg: knowledge of lecturer; organisation of course). Mean ratings for an instructor or course are produced, and they are used "to evaluate professors' teaching effectiveness by comparing them, for example, to department or university average ratings" (Uttl et al 2016 p1). The key issue is whether a high SET rating correlates with student learning - "students learn more from highly rated professors" (Uttl et al 2016). In other words, the validity of SET ratings.

Uttl et al (2016) argued that "any substantive correlations between SET and learning are likely to be a fluke or an artefact rather than due to students' ability to accurately assess instructor' teaching effectiveness" (p2). This is because "learning is dependent to a large degree on students' intelligence or ability to learn, prior relevant knowledge, and motivation to learn" (Uttl et al 2016 p2), and because the students' ability to judge their learning depends on ability or intelligence. This is known as the Dunning-Kruger effect (Kruger and Dunning 1999; appendix 1A). Unskilled individuals overestimate their ability, while highly skilled ones can underestimate their ability and "assume that tasks they found easy were also easy for others" (Uttl et al 2016 p2) [1]. In one study, Kruger and Dunning (1999) asked students to rank themselves in their class on a number of abilities, like logical reasoning skills. Weaker students overestimated their rank "to such a degree that they believed their work deserved B or better grade even though their work received Ds or Fs" (Uttl et al 2016 p2). High scoring students were relatively accurate in their ranking.

The validity of SET ratings is usually established by a multi-section validation design study. Students on the same course but with different instructors rate their

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[1] There are a number of other cognitive biases that might also be relevant (appendix 1B).

teachers, and this is correlated with the examination score of the student. A positive correlation is expected if the SET ratings are valid.

Cohen (1981) reported the first meta-analysis of multi-section studies, which was r = +0.43 for SET ratings and learning, and r = +0.47 for course ratings and learning. This was based on 68 studies from 41 published articles. Cohen (1981) concluded that "student ratings of instruction are a valid index of instructional effectiveness. Students do a pretty good job of distinguishing among teachers on the basis of how much they have learned" (quoted in Uttl et al 2016 p2). Subsequent meta-analyses have confirmed this conclusion, including Feldman (1989) (table 1.1) [2], and Clayson (2009) [3].

Stimulation of interest:

• the instructor puts material across in an interesting way;
• the instructor gets students interested in the subject;
• it was easy to remain attentive;
• the teacher stimulated intellectual curiosity.

Instructor's Enthusiasm:

• the instructor shows interest and enthusiasm in the subject;
• the instructor seems to enjoy teaching;
• the teacher communicates a genuine desire to teach students;
• the instructor never showed boredom for teaching this class; the instructor showed energy and excitement.

Sensitivity:

• the teacher was skilled in observing students' reaction;
• the teacher was aware when students failed to keep up in class;
• the instructor teaches near the class level; the teacher takes an active personal interest in the progress of the class and shows a desire for students to learn.

(Source: Feldman (1989) Appendix A pp633-636)

Table 1.1 - Example of dimensions used by Feldman (1989).

Uttl et al (2016) challenged these previous meta-analyses because "none of them adequately considered the possibility that small-to-moderate SET/learning correlations may be an artefact of small sample sizes of most of the primary studies and small sample bias" (p3).

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[2] This included forty-eight studies from 32 articles, and widened the number of specific characteristics/dimensions of instructors used by Cohen (1981).
[3] Forty-two studies from seventeen articles.

The researchers reanalysed three main meta-analyses - Cohen (1981), Feldman (1989), and Clayson (2009). They concluded:

- Cohen (1981) - Overestimated the correlation between SET ratings and learning. "The inflated SET/learning correlations reported by Cohen appear to be an artefact of small study effects, most likely arising from publication bias" (Uttl et al 2016 p9).

- Feldman (1989) - Small samples and reanalysis by Uttl et al (2016) "indicate that the specific SET dimensions do not significantly correlate with learning" (p9).

- Clayson (2009) - Uttl et al (2016) were highly critical: "Clayson's meta-analysis is not comprehensive, included only a relatively small proportion of relevant multi-section studies, and, oddly, included Cohen's meta-analysis as if it was a multi-section study. As a result, Clayson's findings are largely uninterpretable and his weighted correlation estimate of SET/learning correlations is meaningless" (p12).

Uttl et al (2016) performed their own meta-analysis of multi-section studies. They found 97 studies from fifty-one articles. After statistical analysis, the correlation between SET ratings and learning was found to be around zero (ie: no relationship). They concluded overall: "Despite more than 75 years of sustained effort, there is presently no evidence supporting the widespread belief that students learn more from professors who receive higher SET ratings. If anything, the latest large sample studies show that students who were taught by highly rated professors in prerequisites perform more poorly in follow up courses" (p19).

1.2. APPENDIX 1A - KRUGER AND DUNNING (1999)

Kruger and Dunning (1999) referred to a double burden for unskilled individuals: "Not only do they reach erroneous conclusions and make unfortunate choices, but their incompetence robs them of the ability to realise it" (p1121) [4]. In other words, "the same knowledge that underlies the ability to produce correct judgment is also the knowledge that underlies the ability to recognise correct judgment. To lack the former is to be deficient in the latter" (Kruger and Dunning 1999 pp1121-1122).

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[4] Kruger and Dunning (1999) used incompetent to refer to individuals less competent than their peers on a particular domain.

Kruger and Dunning (1999) tested four predictions in four studies. The predictions were:

i) Unskilled individuals will overestimate their ability/performance compared to skilled individuals (based on objective criteria);

ii) Unskilled individuals are less able than skilled ones to "recognise competence when they see it - be it their own or anyone else's" (p1122).

iii) Unskilled individuals are less able than skilled ones to use social comparison to accurately assess their level of activity.

iv) Unskilled individuals will recognise their level of skill when they (paradoxically) become more skilled.

Study 1

Sixty-five psychology undergraduates at Cornell University in the USA were asked to rate the quality of thirty jokes on an eleven-point scale (from "not at all funny" to "very funny"). The jokes had previously been rated by a panel of eight comedians, and this was the "objective criteria". The participants were asked to rate their success in relation to these criteria (in terms of percentile rankings - eg: 50 - "I'm exactly average").
Individuals in the lowest quartile of ability at recognising good jokes (ie: low skilled) rated themselves as above average, while individuals in the top quartile (ie: high skilled) of ability rated themselves more accurately. The overestimation of the former group was nearly fifty percentile points, and prediction (i) was confirmed.

Study 2

Forty-five more psychology undergraduates from the same university were asked to complete twenty logical reasoning questions. Then they had to rate their "general logical reasoning ability" with other students, how they scored in this test compared to others, and how many questions they thought they had got correct.
As in Study 1, there was a general tendency for all participants to slightly overestimate their ability relative to other students, but most were reasonably accurate about the number of questions correct. But, in terms of ability, the bottom quartile "not only overestimated themselves but believed that they were above average" (p1125), as well as estimating a mean 14.2 questions correct when the actual mean was 9.6 correct

(and overall group mean 12.9). The top quartile were more accurate, if not underestimated their ability - mean estimate of 14.0 questions correct versus 16.9 actual (figure 1.1). Prediction (i) was again confirmed.
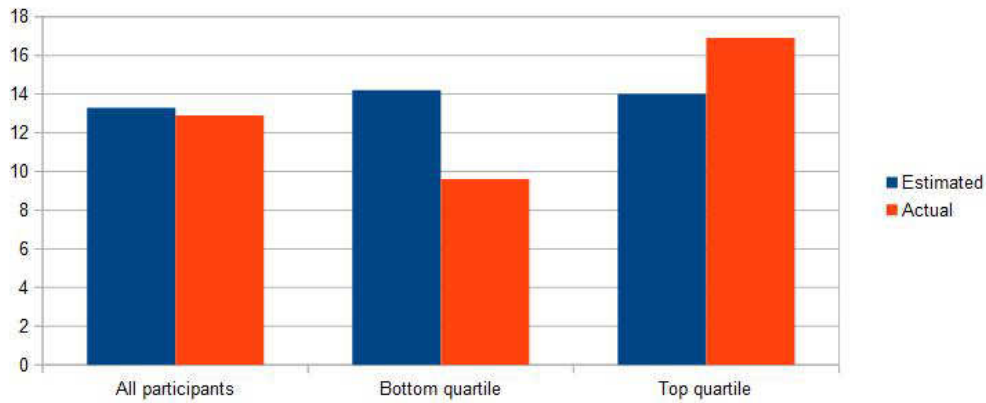
Figure 1.1 - Mean number of correct answers (out of 20) predicted and actual in Study 2.

Study 3

This study with 84 more undergraduates had two parts. In the first part, the participants completed a procedure similar to the previous studies, but with questions about the rules of grammar. The same results as above were found (figure 1.2).
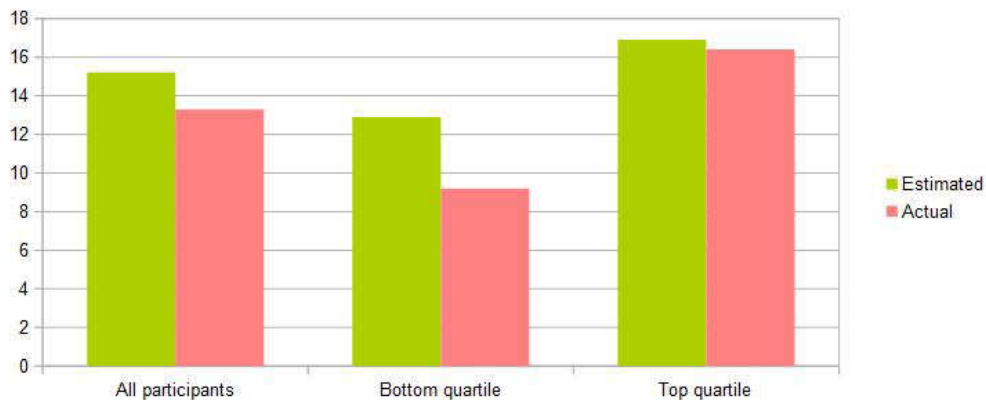

Figure 1.2 - Mean number of correct answers (out of 20) predicted and actual in part one of Study 3.

In part 2 of the study, over one month later, the bottom (n = 17) and top (n = 19) quartiles of participants were invited back. They were given five

tests by other participants in part 1, showing a range of ability, to score. Then they saw their test again and were asked to re-rate their ability. This was testing prediction (ii) - the ability to recognise competence. The unskilled individuals were less able to correctly score the other tests, so prediction (ii) was confirmed.

When asked to re-rate their own ability, the unskilled individuals did not change, while the skilled individuals "raised their estimates of their own general grammar ability" (p1127). This supported prediction (iii).

Study 4

This study with 140 Cornell University undergraduates on a human development course tested prediction (iv). Participants completed a logical reasoning task, and estimated their success. Then half the participants were given training on such tasks, while the other half did an irrelevant control task. After these 10-minute activities, participants were asked to re-rate their success.

Overall, all participants who received training estimated their success on the task more accurately than those not receiving training, but for the initially unskilled individuals, their accuracy improvement was pronounced - ie: "those who had originally scored in the bottom quartile were just as accurate in monitoring their test performance as were those who had initially scored in the top quartile... In other words, the incompetent had become experts!" (Kruger and Dunning 1999 pp1128-1129). This supported prediction (iv).

1.3. APPENDIX 1B - OTHER COGNITIVE BIASES

A well-researched cognitive bias is the "hindsight bias" (HB) (Fischoff 1975) or "knew-it-all-along" effect (Wood 1978), which is "the tendency for individuals with outcome knowledge to claim that they would have estimated a higher probability of occurrence for the reported outcome than was estimated in foresight. In other words, it is the after-the-fact feeling that some outcome was very likely to happen, or was predictable, even though it was not predicted to happen beforehand" (Harley et al 2004 p960).

Harley et al (2004) studied HB in three similar visual perception experiments. In Experiment 1, 42 University of Washington undergraduates were shown pictures of celebrities. Each picture was presented in five stages of blurring to clear, and the task was to name the celebrity as soon as possible (Phase 1). After

this the participants were asked to say at what stage they recognised each picture (Phase 2). There was a tendency to report recognition at an earlier stage (ie: more blurry) than had actually happened. This is evidence of the visual hindsight bias. Knowledge of the outcome influences recall of the event.

Experiment 2 was a replication of the first experiment with one difference. Between Phases 1 and 2 participants were told about the visual hindsight bias. This did not reduce the visual hindsight bias, which suggested it is an automatic, unconscious process that is not easily controlled (Harley et al 2004).

Experiment 3 was another replication with a difference. This time in Phase 2 the participants were asked how soon a same-age peer would recognise the picture. Participants showed the HB in their answers.

Blank and Nestler (2006) argued that HB has three sub-components:

i) "Foreseeability impressions" - an overestimation of the foreseeability or predictability of event outcomes.

ii) "Perceptions of necessity" - "the degree to which event outcomes are perceived as causally determined" (Blank and Nestler 2006).

iii) "Memory distortions" - "people's tendency to misremember, in hindsight, their predictions as having been closer to the outcome than they actually were" (Blank and Nestler 2006).

Blank and Nestler (2006) explored the different aspects of HB using the perceptions of the outcome of a real event. Leipzig in Germany applied to host the 2012 Olympic Games, and was not short-listed by the IOC on 18th May 2004. Residents of the city were participants in the study. In the four weeks leading up to the decision, they were asked to predict the outcome in a foresight questionnaire [5], and then two weeks afterwards to recall their answers to that questionnaire (hindsight phase).
In the foresight questionnaire, 91 of 101 participants predicted that Leipzig would be short-listed, and nine of these completely misremembered their prediction. In the hindsight phase, the rating of foreseeability [6] was significantly greater than before the decision (figure 1.3).

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[5] Eg: "Do you think that Leipzig will be nominated as a candidate city?" yes/no.
[6] Eg: "I know how the IOC decision will turn out" (scored 1-4).

Before decision ■ After decision
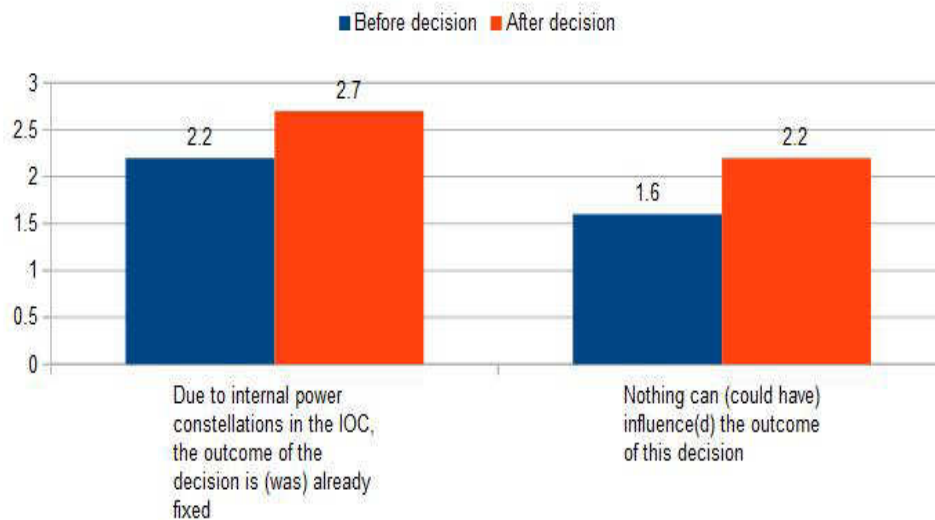
(1 = totally reject; 4 = totally agree)

(Both significantly different at p<0.001 before and after)

(Data from Blank and Nestler 2006 table 1 p152)

Figure 1.3 - Mean scores for two items before and after the IOC decision.

HB is not inevitable, however, as it is less likely for negative self-relevant outcomes (eg: deciding to buy shares that went down in value) (eg: Mark and Mellor 1991). It is possible that "exhibiting the hindsight bias (ie: admitting that one knew it all along) would reflect unfavourably upon one's rationality" (Blank and Nestler 2006 p151). On the other hand, Tykocinski (2001) saw such situations as increasing HB because there is "consolation in the belief that what happened had to happen anyway and one could not do much about it" (Blank and Nestler 2006 p151) (eg: person who you voted for losing).

Blank and Nestler's (2006) study supported this latter idea that HB, or specifically "perceptions of necessity", acts "as a coping mechanism for disappointment" (Blank and Nestler 2006).

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2. BENEVOLENT SEXISM AND ROMANTIC RELATIONSHIPS

      2.1. Benevolent sexism
      2.2. Appendix 2A - Ambivalent Sexism Inventory (ASI)
      2.3. References

2.1. BENEVOLENT SEXISM

      Glick and Fiske (2001) defined "benevolent sexism" (BS) as viewing women as "pure creatures who ought to be protected, supported, and adored and whose love is necessary to make a man complete" (quoted in Lau et al 2008). Glick et al (2000) found that, across nineteen countries, BS was highest in countries with greater gender inequality, and it is also positively correlated with hostile, negative views of women (hostile sexism) [7]. Thus, BS is a system-justification technique - ie: when faced with threats to a socio-political system, individuals use psychological processes, like stereotyping and BS, to bolster the legitimacy of the system (Jost et al 2004).

      Lau et al (2008) showed an example of BS in romantic relationships. They found that "men who experienced system threat had greater romantic interest in women who embodied benevolent sexist ideals than did men who did not experience system threat..." (p21). Thirty-six male Canadian undergraduates read a supposed newspaper article criticising Canadian society (system-threat condition) or one praising the society (no-system-threat condition). Then the participants rated their romantic interest in eight women based on a picture and brief self-description. Half the women were presented as vulnerable, pure, and ideal for making men feel complete (ie: characteristics of BS), and half as career oriented, party seeking, and athletic (ie: anti-BS).
      Participants in the system-threat condition were significantly more attracted to women with BS-characteristics than not (mean: 3.8 vs 3.4 out of 7), while participants in the no-system-threat condition showed no difference between the two groups of women.
      So, "the motive to see the socio-political system as just and fair can lead men to prefer women who embody traits that reinforce gender inequality. Such preferences can create a self-fulfilling prophecy, encouraging women to accept subordinate roles.... Thus, in times of system threat, people who uphold the system may be

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[7] Glick and Fiske (1996) developed the Ambivalent Sexism Inventory to measure hostile and benevolent sexism (appendix 2A).

particularly valued" (Lau et al 2008 p21).

2.2. APPENDIX 2A - AMBIVALENT SEXISM INVENTORY (ASI)

Questionnaires like the Attitudes Toward Women Scale (AWS) (Spence and Helmreich 1972) have been used to measure overt sexism. Items include "sons in a family should be given more encouragement to go to college than daughters", and "it is ridiculous for a woman to run a locomotive and for a man to darn socks". But, by the 1990s, these items "seemed quaint" and "old-fashioned", and there was a decline in their ability to discriminate between respondents (Glick and Fiske 2011).
Talking about the early 1990s in the USA, Glick and Friske (2011) said: "Nobody was arguing that sexism (then defined primarily as hostility toward women) had disappeared, but the 'women are wonderful effect' seemed to confirm that attitudes toward women had, like attitudes toward Blacks, transformed from hostile to ambivalent".
Glick and Fiske (1996) used the term "ambivalent sexism" because it "stems from simultaneously holding two sets of related sexist beliefs: hostile and benevolent sexism" (p494).

Glick and Fiske (1996) developed the ASI with six studies with over 2200, mostly, students in the USA.
Initially, there were 140 relevant statements presented, which were narrowed down to 22 items (eleven covering HS and eleven BS) based on responses (eg: items that distinguished between high and low overall scorers) (table 2.1).

HS items

* Most women interpret innocent remarks or acts as being sexist.
* There are actually very few women who get a kick out of teasing men by seeming sexually available and then refusing male advances.
* Feminists are making entirely reasonable demands of men.

BS items

* A good woman should be set on a pedestal by her man.
* Women, compared to men, tend to have a superior moral sensibility.
* In a disaster, women ought not necessarily to be rescued before men.

All items scored from "disagree strongly" (1) to "agree strongly" (5).

(Source: Glick and Fiske 1996 appendix p512)

Table 2.1 - Example of items from the ASI.

The BS items were found to positively correlate with the use of positive feminine traits to describe women (eg: helpful, gentle), and HS with the use of negative feminine traits (eg: whiny, spineless).

Validity was established by correlating the ASI with other measures of sexism like the AWS (r = +0.63 for total scores; p<0.01).

The ASI was developed to measure three sub-components of hostile sexism (HS) and BS:

i) Paternalism - A "fatherly" attitude, which can dominate (dominative paternalism) as well as protect from affection (protective paternalism).

ii) Gender differentiation - The distinction between the sexes, either justifying male structural power (competitive gender differentiation) or emphasising that women complement men (complementary gender differentiation).

iii) Heterosexuality - As "a genuine desire for psychological closeness" (heterosexual intimacy) or sexual desire for women "inseparable from a desire to dominate them" (heterosexual hostility) (Glick and Fiske 1996).

Factor analysis of responses to the ASI produced a model of the sub-components (figure 2.1).
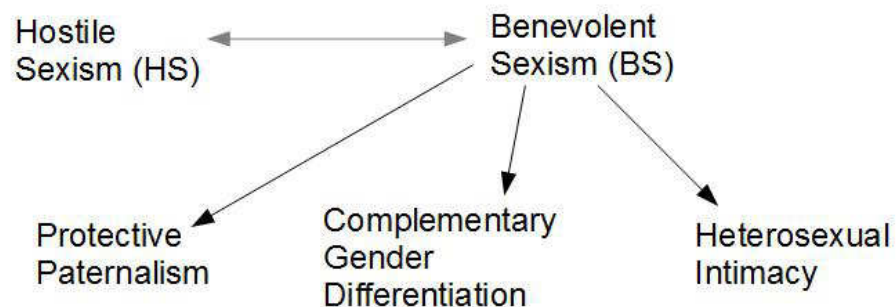
(Based on Glick and Fiske 1996 figure 1 p498)

Figure 2.1 - Model of sub-components of the ASI and HS and BS [8].

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[8] Example of ASI items - "women should be cherished and protected by men" (protective paternalism), "many women have a quality of purity than few men possess" (complementary gender differentiation), and "every man ought to have a women he adores" (heterosexual intimacy).

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3. TWO CHALLENGES FOR FUTURE HEALTH

    3.1. Soil biodiversity
    3.2. Extreme weather and climate change
    3.3. References

3.1. SOIL BIODIVERSITY

    Poor soil biodiversity (ie: less soil organisms
interacting) can have an affect on human health through
increased soil-borne pathogen (eg: anthrax, valley
fever), and through less food, and clean water and air
(Wall et al 2015).
    Anthrax, for example, is caused by the bacterium
Bacillus anthracis, which lives in soil, but if the soil
becomes dust, then wind could blow it in the direction of
human inhalation.
    On the other hand, exposure to soil micro-organisms
is correlated with less allergies. Hanski et al (2012)
found that individuals living near environmentally
diverse areas had a greater variety of bacteria (found in
soil and vegetation) on their skin, which lessened the
propensity for allergies. This has implications with the
increasing urbanisation of the world population (Wall et
al 2015).
    Soil biodiversity is crucial in stable food
production and the infiltration of water, while dust can
lead to respiratory problems. For example, valley fever,
as in the south-western USA is caused by a soil fungus
that normally decays organic matter, but if this is
disturbed by agriculture, spores can become windblown
(Wall et al 2015).

3.2. EXTREME WEATHER AND CLIMATE CHANGE

    Changing weather conditions, particularly extreme
events like droughts and floods, have an effect on
agriculture and food production. "Whether an extreme
weather events results in a disaster depends not only on
the severity of the event itself, but also on the
vulnerability and exposure of the human and natural
systems that experience it" (Lesk et al 2016 p84).
    The effect on crops of extreme weather disasters
(EWDs) is usually calculated using fixed definitions like
"degree days above some threshold", but Lesk et al (2016)
felt that these underestimated the effect, "because
similar extreme weather events may have differing effects
depending on the vulnerability of the exposed system"
(p84).
    In their analysis, Lesk et al (2016) estimated
average national per-disaster cereal production losses

for 1964 to 2007 using UN data, including the effects on cereal yield, and harvested area. During the study period, around 2800 events were classed as EWDs.

A drought reduced national cereal production by 10% and extreme heat by a similar amount, and cereal yields by about half that. Only droughts led to a drop in harvested area. The authors noted: "Droughts may thus be more likely to last long enough to cause complete crop failure and discourage planting, while extreme heat disasters, especially outside key crop developmental stages, may affect crop growth and reduce yields without critically damaging harvests" (Lesk et al 2016 p84).

Extreme cold and floods had less of an effect. Lesk et al (2016) offered the explanation that "floods tend to occur in the spring in temperate regions as a result of snowmelt, and cold weather susceptibility in most agricultural regions is highest outside the growing season..." (p85).

Interestingly, the data analysis showed that technically developed agricultural systems like North America suffered more decline in cereal production than less developed areas. This may be due to smaller, more diverse agricultural systems in the latter areas (Lesk et al 2016).

The response to climate change depends on the perspective taken, including (Adua et al 2016):

i) Ecological modernisation (EM) - The restructuring of modern societies to deal with the challenge along with technological innovations to "green" capitalism (ie: no sacrificing of economic growth).

ii) Political economy (PE) - Technologies are limited in being able to counteract the impact of climate change because they are involved in resource depletion (ie: continued economic growth is a problem).

iii) Human ecology (HE) - Human population size and behaviours have the greatest impact on the world to the point of countering technological developments.

Using data from the 2009 Residential Energy Consumption Survey in the USA, Adua et al (2016) found a mixed picture of how households were adapting their behaviour. On the one hand, technological innovations like efficient light bulbs and programmable thermostats were producing "modest reductions in residential CO_2 emissions". On the other hand, "more affluent households emit more CO_2 and do so at an increasing rate. This clearly contradicts the expectation that post-materialist values associated with affluence will lead people to

reduce their impacts on the environment" [9] (Adua et al 2016 p40). The data were viewed as being more supportive of PE and HE than EM perspectives.

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[9] It has been proposed (eg: Grossman and Krueger 1995) that "there is an inverted U-shaped relationship between per capita income or GDP and environmental degradation, where pollution and other environmental impacts increase in early stages of economic development, but level off and decline once a nation (or other political unit) reaches the requisite level of affluence" (Adua et al 2016 pp28-29).