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The role of contextual factors in judgements: Implications for research into adult learning

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Abstract

The purpose of this paper is to outline some methodological implications for a new theory of workplace learning proposed by Hager and Halliday (2002), who set out a relationship between context, judgement and learning. Learning is seen as concerned with judgements that are potentially fallible but also contextually sensitive. This approach was based on philosophical foundations and was not intended to provide a testable model, however, it has direct implications for the ways in which we structure learning situations (e.g., whether and how learners are able to combine discrete pieces of information). This paper sets out their approach as a Perceptual-Judgemental-Reinforcement approach to adult learning and outlines a specific research methodology for investigating the claim that judgements are based on implicit and explicit factors. The methodology is based upon social judgement theory and multiple-cue probability learning for examining the context of judgement.

The purpose of this paper is to outline some implications of a new theory of workplace learning proposed by Hager and Halliday (2002), who set out a relationship between context, judgement and learning. They saw learning as concerned with judgements that are potentially fallible but also contextually sensitive (Halliday & Hager, 2002). The Hager-Halliday approach was based on philosophical foundations and was not intended to provide a testable model. In this paper an attempt is made to translate their conceptions into a testable Perceptual-Judgemental-Reinforcement model (see Figure 1 for my representation of their ideas) and the following sections of this paper focus only upon the contextual or perceptual part of the workplace learning process.

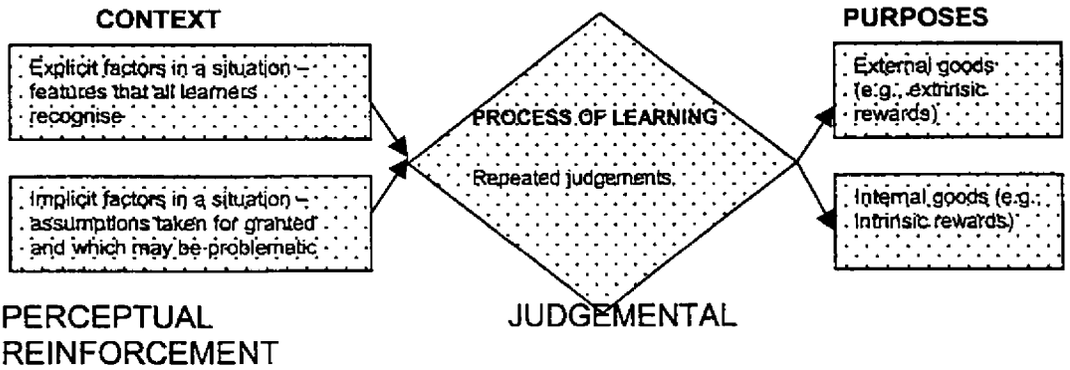

Figure 1: The Hager-Halliday approach expressed as a Perceptual-Judgemental-Reinforcement model of learning (note that the model is recursive)

Hager and Halliday (2002) argued that judgement is central to learning and that interests, purposes as well as features of a situation affect the judgement processes. The starting point for their model is the relationship between factors in a situation and

judgements. A precursor for this perspective is the intellectual work 'Life, Work and Learning. Practice in post-modernity' by Beckett and Hager (2002). This traced the lnks between workplace learning and practical judgements and it was argued that:

> '*...all workers – and indeed all adults in their lives in general, both now and for the foreseeable future – as subjects of learning potential are best regarded as integrated thinking and doing beings who exercise all manner of judgement during the working day – these are their practices*' (p. 40).

Towards the end of their book, they described six aspects of practical judgement that will be referred to in subsequent discussion of studies relevant to this topic:

'1. Judgements are holistic
2. Judgements are contextual
3. Judgements denote
4. Judgements are defeasible
5. Judgements include problem identification
6. Judgements are socially shaped' (p. 185).

The holistic aspect refers to the integration and existence of intermeditate judgements. The contextual description is linked to the combination of information and the fact that judgements reflect changes in the environment. The criterion that judgements denote relates to the fact that judgements have consequences and affect the world around us. Beckett and Hager (2002) noted that judgements may be modified or require change and are therefore defeasible. Finally they referred to judgements in terms of them involving problem identification and often being collaborative or collegial in nature and hence socially-shaped. Of course, these are descriptions that can be applied to judgements but do not refer to the specifics of the antecedent circumstances.

A key aspect of the approach outlined by Halliday and Hager (2002) is that judgements remain contextually sensitive to implicit and explicit features of a situation. They laid out a general plan and at that time did not seek to specify how these features interacted. They indicated, however, that the judgements are based on personally relevant features of a situation. In this respect the model has major similarities to the field of research instigated by Brunswik on the importance of perception and judgement for all human responding (Hammond, 1996). The remainder of this paper deals with the social judgement analysis and outlines some relevant experimental findings that support the contextual aspects of a Perceptual-Judgemental-Reinforcement model of workplace learning.

Social Judgement Analysis

As far back as the early 1950s, Brunswik (1956) posited that an object in the environment (i.e., a distal stimulus) stimulated a person's sensory organs to produce multiple cues (i.e., a proximal stimulus) to the object's identity and properties. Researchers like Brunswik, acknowledged perceptions to be a construction from an incomplete and fallible collection of sensory cues. They pointed out that human judgment is analogous to perception.

Brunswik and his successors outlined a methodology for decomposing the contribution of specific factors in judgements that are made under conditions of

complexity and uncertainty (see Cooksey, 1996). Individuals will differ in their ways of judgement and it is hypothesised this may depend upon the cues or factors in a situation. Figure 2 describes the classic double lens model design as Brunswik conceptualised it. This double system design explicitly compares judgments with values for ecological criterion measures and sets the stage for research on how people learn about the use of cues in the ecology and research into judgmental accuracy and learning.

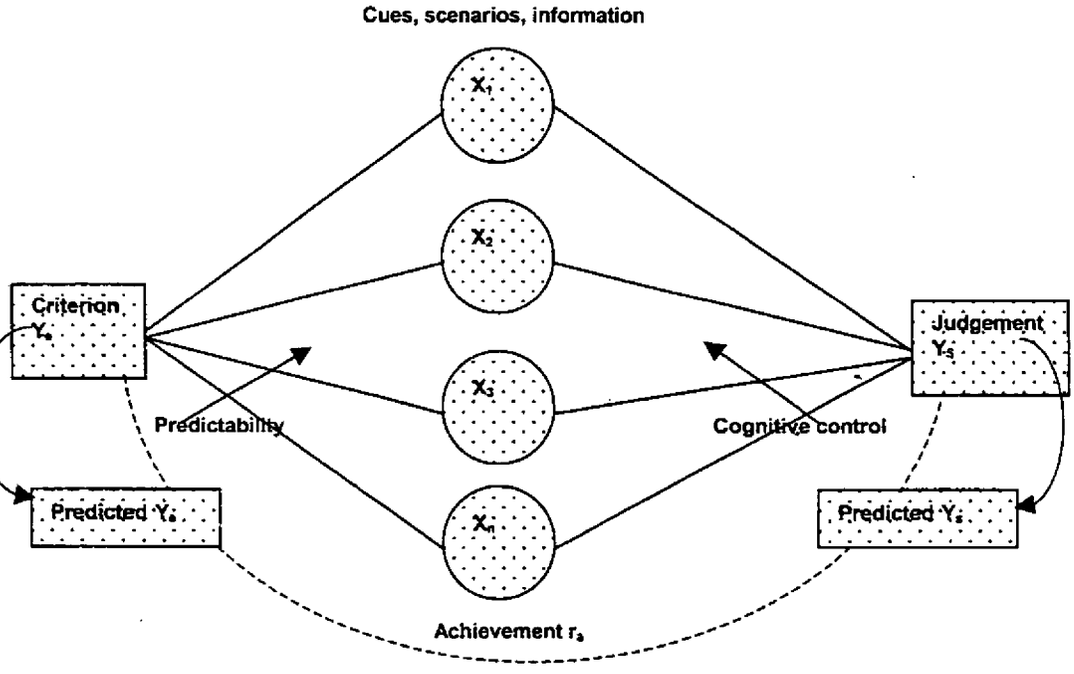

Figure 2: Double lens model for studying judgments

While the representation in Figure 2 may appear daunting at first glance, it is essentially quite simple. It represents a person making a judgement or learning about a situation from information that has been presented to him/her. In Figure 2 the Y_S represents the person's judgments; and the X_1-X_n represent the value of cues, information or details in the situations that are presented to a person. If the person is presented with multiple instances then it is possible to decompose their judgement and determine how the aspects in a situation (X_1-X_n) are influencing their judgements. Furthermore, if we already know in advance the criterion value for the judgement in each situation (i.e., the learning criterion, the optimal response or the correct answer) then it is possible to calculate the relationship between those same aspects in all the situations that we presented to a person and the criterion responses. We can then fit regression equations to both sides of the process to judgements and to the criterion. The predicted judgement is derived from a regression equation fitted to the cues in a situation and the criterion in the ecology. Using the double lens model it is then possible to formulate an important identity (see Figure 3).

The importance of this identity is that it enables us to determine the components of achievement. The lens model was not formulated for educational or workplace learning issues but the notion of achievement has direct relevance and implications for situational theories of learning and cognitive apprenticeship. It offers the opportunity for quantification in an area that has largely been descriptive and anecdotal.

$$r_a = GR_eR_s + C\sqrt{(1-R_e)^2}\sqrt{(1-R_s)^2}$$

where:

r_a = the achievement index (i.e., the correlation between a judgement and the criterion)
R_e = the predictability index (i.e., the multiple correlation of the cues or factors in a situation with the criterion).
R_s = cognitive control (i.e., the multiple correlation of the cues or factors in the situation with the judgement for all scenarios)
G = a knowledge index (i.e., the correlation between the prediction and the predicted judgments for all scenarios)
C = an unmodeled knowledge (i.e., the correlation between the residuals from the above predictions).

Figure 3: Components of Achievement

If the Halliday and Hager (2002) proposal is correct then people will repond to both implicit and explicit features of the situation in lawful but idiosyncratic ways. This should be the case where individuals are exposed to situations in which there is a single, identifiably correct solution or everyday situations where there is a subjectively preferred or personally optimal answer. Their hypothesis lends itself to a focus upon intensive quantitative investigation of a few individuals (e.g., Athanasou & Cooksey, 2001). The benefits of intensive case studies of responses to large numbers of real situations lie in the representative design and ecological validity of the findings. This idiographic approach (rather than nomothetic) leads to the accumulation of observations and enables us to determine what features of the context are likely to be relevant to the future interests of a learner (Athanasou, 1998, 1999).

A number of studies within the context of multiple-cue probability learning have pursued such a focus. The final section of this paper deals with these studies in some detail. The reader who is not interested in these specific details may skip this section.

Table 1: Results from multiple-cue probability learning studies relevant to the Hager-Halliday hypothesis

INVESTIGATORS	JUDGEMENT ASPECTS[1]	KEY FINDINGS[2]
Summers (1962)	Contextual	Cue utilisation was proportional to validity
Bjorkman (1965)	Contextual	Learning occurs more rapidly when categories are homogeneous Transfer is facilitated after training on heterogeneous categories Learning occurs without reinforcement by observation
Newton (1965)	Denote	Outcome feedback containing ecological validities led to significantly improved achievement
Todd & Hammond (1965)	Denote	Information which allowed a person to compare their dependency on cues with their ecological validities was of greater value than knowledge of accuracy
Azuma & Cronbach (1966)	Holistic	Concept formation isolated a sub-universes and identified a rule applying within the sub-universe Concept formation merged sub-universes and applied a single parsimonious rule
Dudycha & Naylor (1966)	Contextual	Pairing an additional cue to one of low validity was always facilitating, while adding an additional cue to one of high validity was always detrimental

Summers & Hammond (1966)	Contextual	Task properties and task information determine inferential accuracy and cue dependence
Bauer (1972)	Contextual	General tendency to choose the more frequent cue irrespective of cue validity
Deane, Hammond & Summers (1972)	Holistic	Performance on tasks requiring complex nonlinear relations can be partitioned into acquisition and application of task knowledge; poor performance can be attributed to incomplete cognitive control rather than incomplete knowledge
Castellan (1973)	Contextual	The number of irrelevant cues had an effect on performance that diminished but did not disappear across trials; and there was an interaction between the number of irrelevant cues and the validity of the relevant cue, the resultant performance decrement being greatest for cues of moderate validity
Steinmann (1974)	Denote, defeasible	Compared with outcome feedback both feedforward and lens model feedback led to increases in the consistency and knowledge components of accuracy
Armelius & Armelius	Denote, defeasible	When people received no feedback confidence was determined by the cue intercorrelation; when people received feedback the effects of the cue intercorrelation on confidence was reduced

[1] Jugement aspects are derived from Beckett & Hager (2002, p. 185)
[2] Findings are quoted directly from Holzman (1999)

Multiple-Cue Probability Learning Studies

Brunswik and Herma (1951) conducted the first study of cue probability learning using a relationship between position and the estimated weight of an object. These studies involved the presentation of cues or information from which a judgement could subsequently be made. The accuracy of the judgement can be compared with the criterion or true result. In such experiments various aspects of the situation have come to be studied including, the nature of the cues, their relevance, their redundancy or extent of intercorrelation, their validity and the type of feedback or outcome information provided to judges. This has provided a large body of literature, some of which is relevant for the perceptual-judgemental-reinforcement model of adult learning. The results from a range of studies that are relevant to the subject of this paper are summarised in Table 1. These are taken from an unpublished *Annotated Bibliography of Cue Probability Learning Studies* by R. J. Holzworth (1999).

Implications

These studies show that much of our human judgement and learning is quasi-rational and based on perceived relationships. It ranges along a continuum from intuitive to analytic. The findings of earlier studies linked perceptions with learning and support the general framework of the Hager-Halliday hypothesis but the relations are probably more complex than those envisaged by Beckett and Hager (2002). It seems unlikely that isolated case studies of judgements (no matter how real or descriptive) will provide a substantial and accumulated base of theoretical knowledge of judgement and decision making in the context of adult learning.

The selected multiple-cue probability learning studies that were reviewed showed *inter alia* that the use of cues was dependent on the relevance or validity of the information provided. Learning was easier when the information provided was clustered in some way and that this facilitated transfer. A consistent finding was that feedback on the accuracy of judgements may not be as important as first imagined by

many laypersons. It may be more helpful to provide information about the nature of the decision-making ecology within which judgements are being made.

Most of the six judgement aspects described by Beckett and Hager (2002) have been covered in the cue probability learning studies. The astute reader would have noticed that the problem identification and socially shaped aspects were not mentioned. This is due to the limited number of studies using adults or the limited applications in work settings as well as my selection of examples that focused on theoretical rather than applied studies. Problem identification and socially shaped aspects tend to feature in the applications of cue-probability learning. For example, medical diagnosis was investigated by Tape, Kripal and Wigton (1992) who studied the role of feedback in the prediction of cardiovascular disease.

The Halliday-Hager hypothesis considered that both implicit and explicit factors influence perceptions and judgement. The multiple-cue probability learning studies that were reviewed, however, did not make this distinction and this appears to be fruitful field for future research. The implicit and explicit factors might be considered as sub-universes of information to which separate judgement heuristics are applied initially. Decisions about the sub-universes might be gradually merged using a more parsimonious judgement heuristic. Subsequently there may be a need to consider separately the stages of knowledge and application. That is, conscious awareness or theoretical knowledge may not be translated readily into real-world problem solving and application.

Judgements also reflect our use of specific cues or criteria and it has been shown that there is a great deal of individuality in this process. This is especially the case when judgements are made under conditions of uncertainty and where there are probabilities involved. We have known for some time that experience does not necessarily improve people's judgements because biases prevent people from using the information offered by experience (see Brehmer, 1980). For instance, Brehmer reported that these biases include (a) the use of confirmatory evidence; assumptions about causality; and (c) disregard of negative information. Faced with such lawfulness in individual behaviour and the incongruities o decision making under conditions of complexity then the only way ahead may be to consider a program of research that documents the idiosyncrasies of each person's judgements and learning in different contexts and under varying conditions.

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Note:

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