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Helping students succeed through using reflective practice to enhance metacognition and create realistic predictions

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Understanding how students can better manage their expectations has been a topic of interest in pedagogy for some time, yet solutions remain elusive. This paper describes a recent study which aimed to help students make more realistic predictions by increasing their metacognition. At the outset, participants completed a metacognitive awareness inventory and were asked to predict the grade for their next assessment. They were instructed on how to use a structured reflection spreadsheet and asked to reflect weekly for the study period. At the end of the study, the inventory was re-administered and participants predicted the submission time and grade for the next assessment. Although results showed a significant increase in scores in metacognition, they did not show improved prediction accuracy. Possible reasons for the outcomes and further work are discussed.

Keywords: *Metacognition; higher education; student satisfaction; expectation; reflection.*

AN EXPECTATION is a prediction about a future event or outcome. Predicting the future is notoriously difficult and in an attempt to manage the complexity of processing mental tasks, such as making predictions, humans typically turn to heuristics (Simon, 1957). These are readily available experience-based techniques which allow us to derive a satisfactory, rather than optimal, prediction. Despite evidence suggesting heuristic-based predicted outcomes can differ significantly from actual outcomes (Tversky & Kahneman, 1974), we tend to have high confidence in them (Fischhoff, Slovic & Lichtenstein, 1977). Moreover, predicted outcomes are typically biased in one direction: towards overestimation of ability, skills and knowledge (Dunning, Heath & Suls, 2004; Dunning et al., 2003; Fischhoff et al., 1977; Buehler, Griffin & Ross, 1994). Thus the incongruence between predicted and actual outcomes can result in dissatisfaction which in turn determines students' satisfaction ratings (e.g. Moore, Moore & McDonald, 2008). A great deal of importance is based on satisfaction ratings in higher education (HE) as they can affect the reputation of the Higher Education Institution (HEI), tutor (2008) and attrition rates. While it is clearly in the interest of all to improve satisfaction, there is a paucity of research investigating the relationship between students' prediction accuracy and satisfaction ratings. Rather, findings from studies investigating student satisfaction typically encourage staff to provide environments that surpass student expectations (e.g. Ferguson DeJong, 2008) without investigating the bases on which the expectations were derived.

Metacognition (Flavell, 1978) has been found to be a predictor of successful learning and academic performance (e.g. Dunning et al., 2003), intelligence (e.g. Sternberg, 1984) and confidence (Kleitman & Stankov, 2007). Metacognition is the awareness, monitoring and control of one's cognitive processes. Thus it follows that

more accurate predictions, as a result of more accurate self-perception, could be developed through increased metacognition (Swartz & Perkins, 1989). In addition, this would increase students' autonomy (Boud, 1995; Livingston, 1997). However, in order to become more metacognitively aware, one needs to be critically reflective (e.g. Schön, 1982; Dewey, 1939) and to learn from reflective practice, weaknesses as well as strengths need to be scrutinised (Dewey, 1939). Evidence has shown that weaknesses are less considered when reflections are read or assessed by a tutor as students tend to demonstrate knowledge and hide ignorance (Boud, 1999; Sumsion & Fleet, 1996). Therefore, not assessing reflections and using information and communication technology (ICT) for reflective practice could be advantageous as it is interpreted as less judgemental, thus increasing disclosure and honesty (Kettinger & Grover, 1997). Additional advantages such as its 24/7 accessibility have often been cited (e.g. Barak, 2006; Paulus & Roberts, 2006; Aleven & Koedinger, 2002; Lin et al., 1999).

Mair (2009) developed a structured spreadsheet for critical reflective practice situated on the university's virtual learning environment (VLE) in an attempt to move from traditional learning journals which are assessed, and others which lack structure and guidance. The aim was to facilitate critical reflective practice in a private, familiar and accessible format. Moreover, because the spreadsheet format makes previous reflections available while current reflections are being entered, the student takes part in meta-reflection (Dewey, 1939; considering past as well as current reflections); reflecting on and in practice (Schön, 1982) such that meaning becomes learning (Mezirow, 1991). In effect, when using the spreadsheet students enter, store and retrieve reflections across rows, guided by column heading and examples such as 'How can I apply what I have learned in other contexts?' whilst previous reflections are displayed in rows above (providing meta-reflection) via the VLE (providing continuous accessibility). Moreover, to encourage disclosure, reflections are neither read nor assessed. In a body of work since 2009 Mair and Taylor have consistently shown improved metacognitive awareness following use of the reflective spreadsheet.

In order to help derive more realistic self-perceptions, the study described below aimed to encourage students to develop more realistic predictions (expectations) by enhanced metacognitive awareness developed through online, structured, critical reflective practice. To determine the relationship between metacognition and prediction accuracy, participants in the present study were encouraged to reflect critically for six weeks and to predict the outcome of two assessments. The hypotheses were that reflective practice would lead to increased metacognitive awareness and there would be relationships between metacognitive awareness and prediction accuracy, and among the amount of participation and post-study metacognitive awareness and prediction accuracy.

Ethical approval was obtained from the Department's Ethics Committee prior to commencement. Year 2 undergraduate psychology students were asked to complete the Metacognitive Awareness Inventory (MAI; Schraw & Dennison, 1994) and reflect weekly on their learning via the VLE for six weeks as a 'structured learning' exercise in part fulfillment of their coursework. Fifty-five students consented to the MAI data being analysed for the purposes of this study. The MAI was used to measure self-reported metacognitive awareness. The 52-item MAI measures a range of aspects of metacognition such as monitoring, planning, comprehension using a six-point Likert scale. A structured spreadsheet for reflecting, based on Mair (2009) was used to encourage reflective practice on learning. Instructions were given at the outset and were available online. The study required students to: (i) complete the MAI before and after the study; (ii) predict the grade for their next assess-

ment (A1); (iii) reflect on their learning using the structured reflection spreadsheet on the VLE; and (iv) predict the grade they would be awarded for their next assessment (A2). At the outset, participants were instructed on using the reflection spreadsheet. The instructions were also available on the VLE. MAI baseline and post-study scores were compared, and students' grades were compared with actual grades for A1 and A2. Data from the 68 participants completed each of the required aspects of the study were included in the analyses.

The MAI demonstrated high internal consistency both pre- and post-intervention (Cronbach's α=.92 and .94, respectively). The mean MAI baseline scores increased significantly from baseline to post-study ($t(35)$=–3.58, p=.001) and demonstrated a significant main effect ($F(1,34)$=10.42, p=.003). There was no significant difference between prediction accuracy for A1 and A2 ($t(17)$=-1.48, p=.16), but grade prediction error was positively correlated with baseline MAI scores (Table 1).

Discussion and conclusions

Students arrive at university with high expectations and consequently some become dissatisfied when actual outcomes do not correspond with their expectations. Typically, expectations are built on error-prone heuristic-based predictions (Simon, 1957) which are likely to be biased towards overestimation of ability (Tversky & Kahneman, 1974). The resulting disappointment can lead to a sense of injustice, provision of poor feedback on staff and increased attrition rates. Programmes aimed at increasing metacognition, such as critical reflection, can enable students to improve self-perceptions of knowledge and skills (e.g. Boud, 2004) which should enable them to produce realistic predictions.

In the present study, an online, structured reflection spreadsheet (e.g. Mair, 2012; Mair & Taylor, 2012) situated on the VLE was used to enhance metacognition over a six-week period and to investigate whether the intervention would lead to more accurate grade predictions for two assessments (A1 predicted at baseline; A2 predicted post-study). Metacognition, measured at baseline and post-study using the MAI, significantly increased over the period of the study, but this did not correlate with improved grade prediction accuracy. We also investigated the impact of amount of participation on metacognition and on prediction accuracy. We found that although no significant difference was found between grade prediction accuracy for A1 or A2, it was affected by amount of participation, as were post MAI scores. Moreover, participants with greater prediction error for A1 reflected fewer times over the course of the study and the lower the participation, the greater the difference between predicted and actual grade for both A1 and A2. Although MAI scores could be an indicator of engagement, there exists a problem beyond the ability to accurately predict grades given the well-documented benefits of metacognitive awareness. Despite low prediction error in

Table 1: Mean MAI, predicted and actual grade and participation.

	Baseline (mean (SD))	Post-study (mean (SD))
MAI	4.12 (0.47)	4.23 (0.48)
Predicted grade	60 (5.88)	62.83 (4.25)
Actual grade	60.86 (8.80)	60.72 (9.62)
Prediction error	–0.86 (A1)	+2.11 (A2)
Participation	11.21 (4.99)	

this study, confidence in ability did increase over the six-week period and it is unknown whether this trajectory would continue with continued reflection. Although confidence is desirable and can lead to better performance, it can also lead to unrealistic (biased) expectations (Kleitman & Stankov, 2007).

The study was limited by a small sample and by the fact that students were required to participate in part fulfillment of their degree, but the work was not assessed. The latter point benefits disclosure, but is unlikely to encourage participation for less motivated students. In future, it would be interesting to analyse existing data on student expectations to draw out the main factors such 'feedback' and 'staff availability' and investigate those factors at different times during the degree programme. For example by asking students to keep track of the instances these factors are encountered and apply sustained critical reflective practice on them. Finally, the vehicle for prediction (Year 2 assessment grades) may not be the most suitable as student grades generally do not have great variability and by Year 2, most students can accurately predict what grade they will receive. The findings raise some important questions: first, how can we engage students who are low in metacognitive awareness? Second, how can we increase metacognition while tempering confidence? Third, what are the most influential factors for student expectations.

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