**Metacognition, calibration and self-regulated learning: An exploratory study of undergraduates in a Business School.**

**Abstract:**

Self-Regulated Learning (SRL) is a fertile ground for research into learning in Higher Education. Until now, the dominant research methodology has concentrated on quantitative analyses of separate components within the Zimmerman model with the aim of isolating possible factors in learning trajectories and evaluating their relative importance in the process of learning. Recent approaches to SRL research look to not only measure students’ progress but also investigated how interventions may generate a positive impact on learning from a qualitative perspective. This research adopted a qualitative approach and so contributes to the creation of new avenues for SRL research. The research conducted over two years, involved students enrolled on undergraduate degree in a Business School at a post-1992 University in an evaluation of learning diary as a learning aid. The findings suggest that learning diaries may provide scaffolding support for students, especially those that lack confidence.

**Keywords: Learning diaries; Metacognition; Self-Regulated Learning; incrementalist and entity learning; Business school.**

**Introduction:**

The development of self-regulated learning (SRL) as a theoretical construct has provided researchers with new insights as they search for a deeper understanding of how we learn (Bandura, 1986 1997; Boekaerts, 1999; Pintrich, 2000; Zimmerman, 2009; Bembenutty, Cleary & Kitsantas, 2013). Roth, Ogrin & Schmitz (2014, 3) note however that: ‘Despite the large number of studies on SRL published in the past decades, there is still no universal definition of SRL; and each model places emphasis on different aspects’. Along with notable contributions from Bandura (1986) and Pintrich and de Groot (1990), Barry Zimmerman’s (1986) three stage model of SRL has drawn interest from researchers as they look to conceptualise the learning process. Although Zimmerman’s version is the chosen theoretical model upon which this paper is predicated, we should acknowledge that there is still some conceptual overlap and inconsistency within the literature on SRL. This conceptual pluralism is important as it impacts of how researchers interpret others’ work, what types of research questions we ask, and how we develop our discourse related to learning. What researchers can agree on is that SRL ‘is regarded as a necessary prerequisite for life-long learning’ (Klug, Ogrin, Keller, Ihringer & Schmitz (2011, 51), and that involves an individual ‘being active in his own learning process behaviourally, metacognitively, and motivationally’ (Arsal, 2010, 85). This paper sets out to address two research questions: how aware are students’ of how best to regulate their learning, and how can learning diaries be developed to enhance students’ metacognitive skills? The research adopted a qualitative approach in order to explore the possible benefits of learning diaries as learning tools to develop metacognitive awareness for undergraduate students at an English Business School.

**Literature review:**

*Approaching a definition of SRL as a working model:*
According to Schunk and Usher (2013), Zimmerman’s model of SRL (see Figure 1) has three principal aspects that make it a particularly useful starting point for educationalists. Firstly, it describes a complex multi-dimensional system within which interacting sub-processes operate and so provides a conceptual underpinning of how learning occurs. Secondly, Zimmerman (1986) highlights the importance of a student’s choice and decision-making regime in the regulation of these sub-processes. Finally, as Schunk and Usher (2013, 9) suggest, ‘development of students’ self-regulatory skills requires that they be taught these skills and given opportunities to apply them’. In this respect, the model may provide such insights into the learning process that enable subsequent interventions in order to improve students’ learning and performance. Winne and Perry (2000) describe Zimmerman’s model of SRL as ‘process-oriented’, in contrast to the model proffered by Pintrich and Garcia (1994) which is viewed as component-oriented and concerned primarily with a student’s preferences or individual attributes. For Roth et al. (2015, 3) this means that learning is a cyclical process in which:

‘Authors adopting a process-oriented approach focus on the coordination, control and regulation of these strategies in the consecutive stages of the learning process…. In these phases, the learner sets goals and plans their pursuit, executes specific learning strategies to reach those goals, and reflects on their learning outcomes, which in turn influences the subsequent pre-action phase via a feedback loop’.

Zimmerman’s (1986) process-oriented model of SRL is shown below in Figure 1.

Figure 1. A representation of Zimmerman’s process-oriented model of SRL.

A central tenet of SRL is encouraging students to understand how they learn is vital to improving their performance. Research has highlighted the benefits of mastering ‘SRL competence’ (Dresel, Schmitz, Schrober, Spiel, Ziegel, Engelschalk, Joestl, Roth, Wimmer, & Steuer, 2015, 56) and the lack of regulatory skills amongst undergraduates (Virtanen, Nevgi & Niemi, 2013). The development of SRL awareness and skills amongst students through a structured programme of SRL training is key to improving their learning. Moreover, the demands of university study are challenging and it is at this level where the inadequacies of study techniques are exposed. For Ning and Downing (2015, 1332):

 ‘The concept of SRL has become increasingly important in higher education.

Contrary to primary and secondary schooling, university education imposes distinctive demands on students, which requires them to be proactive and self-disciplined learners capable of controlling their own learning via self-monitoring and self-evaluation.

Facilitating students’ awareness of how to regulate their learning is integral to contemporary developments within Higher Education (HE) and supports students’ future career development. Universities are engaged in a process of change in which they are re-evaluating how their deliver their curriculum. For example in the United Kingdom, Healey and Jenkins (2009) argued that ‘all undergraduate students in all higher education institutions should experience learning through, and about research and inquiry’. This call to shift the paradigm of university education from teacher-led delivery to one that was based on research and the student’s self-regulation of learning echoed developments elsewhere, particularly in the United States where the Boyer Commission (1998) had initiated a reappraisal of established practice. The ability of students to undertake self-regulation of their learning is particularly apposite in relation to the students surveyed in this research as they were enrolled onto a degree that placed them in a work environment for prolonged periods. In being away from the classroom, and the support of their teachers, students were expected to perform as employees not undergraduates. Not only is the contemporary workplace fast paced and varied in its skill sets, employers now also expect employees to assume responsibility and to demonstrate initiative both as individuals and as team players. The importance of ‘learning through reflection’, and the role of diaries, is widely recognised in the literature on work-based learning (Cox, 2005; Helyer, 2015; Schunk & Zimmerman, 1998; Walker, Cooke, Henderson, & Creedy, 2013). It is within this work context that the ability to learn and adapt is prized and why SRL is so important to future graduates career progression.

 *Metacognition and its relationship with SRL:*

Metacognition is an integral sub-process identified within leading models of SRL (Pintrich & de Groot, 1990; Zimmerman, 1986). Although often mistakenly reduced to mere reflection, metacognition plays a vital role in a student’s management of their learning journey, and for Ning and Downing (2015, 1329) ‘involves strategies such as goal setting and self-testing to monitor and evaluate one’s own learning progress’. Although research has been undertaken during the past three decades into the nature of the sub-processes within each of Zimmerman’s three phases of learning, there is still much to be done in terms of evaluating the relative importance of each of the sub-processes, such as metacognition, in relation to the other sub-processes such as self-efficacy or fear of failure. The literature on metacognition is still exploring the impact of metacognition with contrasting findings. For example, although some research (Sperling, Howard, Staley & DuBois, 2004; Kitsantas, Winlser & Huie, 2008) has identified relatively little linkage between the development of metacognitive skills and academic attainment amongst first year undergraduate students, Dunning and Kruger (1999) report that weaker attainment is not simply tied to a lack of subject knowledge but a failure to develop metacognitive skills. For Chen and Rossi (2013), there is a clear linkage between metacognition and a learner’s choice of learning strategies, although this choice is also influenced by other sub-processes such as their level of intrinsic motivation and the challenge presented. This choice is the outcome of an individual’s metacognitive awareness, and for Chen and Rossi (2013, 264),’students may differ in terms of metacognitive awareness and that such differences can have considerable effects on academic performance’. The challenge for educationalists is therefore to support the development of students’ metacognitive awareness.

 First coined by Flavell (1979) metacognition offers a model of how students respond to their changing learning environment. For Flavell (1979) metacognition was characterised by two principal concepts that relate to individual students. The first, metacognitive knowledge referred to what students believed about their learning preferences and what they understood learning to be. The second, described as metacognitive experience related to students’ emotional state because of their education. This model of metacognition was developed further by Efklides (2011) who made a distinction between metacognitive knowledge (MK) and metacognitive skills (MS), as well as acknowledging the importance of metacognitive experience (ME) in conditioning a student’s approach (see Table 1 ).

|  |  |  |  |
| --- | --- | --- | --- |
| **Metacognition concept**  | **Defined as…** | **Evident in…** | **Comments…** |
| Metacognitive experience (Mastery)(ME) | How a student’s personal history conditions their approach to learning | Emotional state | Understanding of self-concept*‘I am…’* |
| Metacognitive knowledge (MK) | Knowledge of being a student- A student’s knowledge of how they approach learning , the nature of the task, as well as their goals and preferred strategies | Interpreting tasks;Identifying goals;Beliefs about memory and intelligence; | Understanding of learning*‘I can….’* |
| Metacognitive skills (MS) | How a student usually approaches study | Planning;Cognitive approaches;Self-monitoring;Self-evaluation | Understanding of how they control of their learning*‘I will…’* |

Table 1. An overview of Metacognition, with reference to SRL sub-processes

A number of models of metacognition are available in the literature on SRL. Efklides (2011) offers the Metacognitive Affective Model of SRL (MASRL) that aimed to explain the interaction of metacognition with motivation, whilst Winne (2004) identified an alternative cognitive framework through the conditions, operations, products, evaluations and standards (COPES) model, and chose to focus on the task-specific aspects of SRL. For Nelson and Narens (1994) the key to understanding metacognition is to view metacognition as the monitoring and organisation of information through a processing system of acquisition, retention and retrieval. However, Efklides (2001, 8) argues that [Zimmerman’s model] is compatible with the conception of SRL as a top-down process leaving less room for spontaneous ME such as metacognitive feelings and affect that serve a bottom-up self-regulation mode’. Nevertheless, the identification of metacognition as a regulator in learning strategies is an important step forward in the development of SRL theory, and has led to research into the impact of particular interventions in order to improve attainment. Schraw and Dennison (1994, 123) found that higher metacognitive awareness was ‘significantly correlated with higher reported strategy use’. In particular, effective metacognitive awareness was associated with more sophisticated forms of learning and critical insight that led to higher levels of performance (Vrugt & Oort, 2008). This finding echoes research undertaken elsewhere (Zeegers, 2004; Richardson, Abraham & Bond, 2012), and invites further exploration of the role of metacognition as one of the sub-processes in the SRL model.

*Calibration: is it possible to categorise students?*

 The literature on metacognition highlights the central role of calibration in the decision-making process of students (Bol, Riggs, Hacker, Dickerson & Nunnery, 2010; Chen & Rossi, 2013; Chen, 2003; Pajares & Graham, 1999). For Chen and Rossi (2013, 265):

 ‘This positive relationship between calibration and student achievement has been

well documented. The higher achievement of better-calibrated learners is due to the

greater likelihood that students are basing their study strategy decisions on more accurate assessment of both what they know and what they do not know’.

Researchers define calibration as the relationship between a student’s perception of their performance and actual outcome (Hacker, Bol & Kenner, 2008; Chen & Rossi, 2013), and place it both prior to and after assessment. As such, calibration is linked to concepts such as self-efficacy, self-worth and task-analysis where students judge what strategy they are likely to pursue in completing an assignment. Importantly, Pajares and Graham (1999, 126) report that, ‘high ability students have stronger self-efficacy and are more accurately calibrated, that is that they have more accurate self-perceptions’. In contrast, ‘poorly calibrated students may… over estimate their knowledge of material… and therefore terminate their studying than students with the same knowledge level who more accurately assess their content knowledge’ (Chen & Rossi, 2013, 265). This discrepancy between the metacognitive awareness and levels of confidence of high and lower attainment students has been described as the ‘Dunning and Kruger effect’, after their research (1999) into the levels of metacognitive awareness amongst undergraduate students. This discrepancy, albeit subsequently challenged by Krueger and Mueller (2002), has important implications for the work of university teachers and the ways in which they conceive teaching and learning.

 Research has generated numerous typologies of idealised student SRL profiles. According to Ning and Downing (2015, 1342),’the profiling of student self-regulated strategies can enhance our understanding of the complex range of processes that they employ, as well as informing future intervention protocols and advancing research in curriculum design in the higher education setting’. Barnard-Brak, Lan and Paton (2010) produced a typology of five profiles of online university students being: super-self-regulators; competent self-regulators; forethought-endorsing self-regulators; performance/reflection self-regulators, and minimal self-regulators. Ning and Downing (2015) have similarly reported on four profiles of students: competent, cognitive-oriented, behavioural-oriented, and minimal self-regulated learners. In addition, research into postgraduate students in Finland, Virtanen, Nevgi, and Niemi (2013, 31) reported on those students who were categorised as being: excellent in SRL, aiming high with insufficient SRL, and finally, distressed performers. For Virtanen et al. (2013, 33), the value of their research is ‘that it reminds educators that university students are a heterogeneous group and there is a broad variation in their SRL skills’. Such an observation hints at the limitations of such research. There is relatively little evidence of the Higher Education (HE) curriculum being differentiated and delivered along the lines of personalised learning as is evident in the schools sector. Ultimately, such research must be integrated into the planning of the curriculum and embedded into teaching and learning, otherwise it is of limited utility other than labelling students.

*Calibration: the social and affective contexts to self-evaluation*

 Understanding why students adopt different, and sometimes unjustified, conceptions of their academic competence is essential in any attempt to support their learning. According to Bol, Hacker, O’Shea and Allen (2005, 271) ‘social-cognitive factors… play a role in the accuracy of calibration’. In part, the influence of the teacher and both their formative and summative feedback should factored in to the complex algorithm of the learning process. Echoing the social cognitive origins of SRL theory, Goudas, Kolovelonis and Dermitzaki (2013) suggest that positive social feedback should reinforce confidence early in the learning process but be scaled down once mastery is demonstrated. This scaffolding approach via formative feedback especially reflects the social constructionist ideas of Vygotsky (1934/1986), as well as Bandura’s (1986) social cognitive learning theory. Moreover, given the cyclical nature of Zimmerman’s model of SRL, feedback is not limited to a single learning experience but influences how a student may approach another task in the future. For Fluckiger, Tixier y Vigil, Pasco and Danielson (2010, 137), ‘effective formative feedback must be specific, simple, descriptive, and focussed on the task. This allows learners to set clear expectations of themselves and to make decisions that influence their own successes’.

 According to Bol et al. (2005, 271): ‘research on attributional or explanatory style may also be used to account for differences in calibration accuracy between lower and higher achieving students’. Research (Jiang & Kleitman, 2014) suggests that strategies conceived to reinforce or sustain personal esteem may impact on the accuracy of students’ calibration. Described in the literature variously as ‘hedonic bias’ (Weiner, 1986), ‘protection of self-worth’ (Covington, 2004), or ‘attributional egotism’ (Snyder, Stephan & Rosenfield, 1978), Bol et al. (2005, 271) suggest that ‘students who fail an exam are more likely to attribute the cause … to an external or situational factor, whereas students who succeed are more likely to make internal or dispositional attributions’. In addition, Pajares and Graham (1999) report a ‘confidence gap’ between male and female students, with male students more confident in their potential to excel, although this research could usefully be extended across the full range of subject specialisms and more countries, especially as more recent reports suggest that females are now out performing males in developed societies such as the United Kingdom (Hillman & Robinson, 2016). Jiang and Kleitman (2014) note that:

 Within educational settings, it is important to recognise that the learner may

adopt self-protective and self-enhancement motivations that impact upon their metacognitive experiences, as well as their psychological well-being’.

Students adopt either self-protective of self-enhancement behaviours in response to the ‘reactivity effect of self-monitoring’ Klug et al. (2011, 55). It is important that teachers recognise the affective context to learning and its conditioning potential for future learning. Given this research, greater consideration should be given to how feedback is provided within HE.

*Supporting metacognition through awareness-raising:*

 Research reports that a formal programme of instruction in the development of metacognitive awareness benefits both learning and attainment. (Bol et al. 2005; Dorrenbacher & Perels, 2016; Nietfield, Cao & Osborne, 2006; Huff & Neitfield, 2009; Gutierrez & Schraw, 2015; Tuckman & Kennedy, 2011). As Karlen (2016, 263) recognised, [we] cannot assume that … students are already highly skilled self-regulated learners…. Students may benefit from a systematical and continuous support of SRL’. The importance of educating students in what metacognition is and how it can inform more effective learning strategies is integral to the process of intervention. Vula, Avdli, Berisha, Saqipi and Elezi (2017) report on the need to preface teacher intervention with an explanation to students of metacognition in an accessible manner. Vula et al. (2017) also agree with Karlen (2016) that metacognitive awareness be induced within the curriculum at an early age, so that students may refine their learning strategies as they mature as self-regulated learners. Winne (2017) offers three possible actions for teachers: use gather data on student behaviours, present this data to students in order to promote metacognition and then encourage students to experiment with alternative learning strategies. For Karlen (2016, 253) awareness raising by teachers can develop a student’s metacognitive strategy knowledge which:

Is broadly defined as cognition about cognition…. Metacognitive strategy knowledge refers to the knowledge of what measures can be taken to successfully solve a problem and encompasses knowledge of the relative benefit of a learning strategy over another. Therefore metacognitive strategy knowledge enables students to know why and when a specific learning strategy is useful.

Artelt and Neuenhaus (2010) reported that those students with high metacognitive strategy knowledge outperformed those with who used a limited number of learning strategies, as they were able to modify their learning behaviours more effectively given changing circumstances. Artelt and Neuenhaus (2010) also reported that those students who displayed a high level of metacognitive strategy knowledge and an extensive range of learning strategies achieved the best outcomes in their studies. It should be noted, however, that it may be difficult to isolate metacognition strategy knowledge from other conditioning factors in a student’s approach to learning. As Kleitman and Stankow (2007) note self-confidence may play an equally important role in the way students approach a task and SRL theory has yet to produce a consensus over the inter-relatedness of those processes involved.

Calibration is integral to the operation of metacognitive knowledge strategy as it provides perspective for individuals on may work for them in terms of effective approaches to learning. According to Gutierrez and Schraw (2015 387), ‘studies suggest that calibration accuracy is a malleable skill that improves when a variety of scaffolding techniques are used to support learning and self-regulatory activities’. In their research into the benefits of offering financial incentives and metacognitive instruction, Gutierrez and Schraw (2015) report that the impact of incentives is limited to simple or routine tasks. However, Gutierrez and Schraw (2015) report that as little as a one-hour programme of instruction is able to generate benefits for students both in pre-test and post-test contexts. Not only did Gutierrez and Schraw (2015) report improved levels of student achievement, they highlighted the growth in confidence amongst students- a notable finding when one considers the prevalence of self-efficacy and fear of failure in the SRL literature. Given the findings above, it would seem appropriate to offer undergraduates metacognitive skills training. In doing so, students would be able to develop their skills as part of their approach to life-long learning.

 According to Veenman (2013, 300) almost 40 per cent in the variance of students’ achievement could be attributable to their expertise in the use of metacognitive skills. A number of researchers have implemented a variety of intervention strategies to promote metacognitive awareness. For example, Zimmerman (1994) introduced a one-semester instructional programme to develop strategic planning with emphasis given to setting goals, analysing the nature of the learning task and effective time management. Azevedo, Greene and Moos (2007) explored the benefits of providing a member of teaching staff as an advisor at a university for undergraduates. However, for Veenman (2013, 305), ‘any successful instructional program for metacognitive skills abides with …three principles and the WWW&H rule’. The three underpinning principles of successful instruction are: embedding the instruction within the study programme itself, providing informed training by trained teachers and delivering the instruction over an extended period. Irrespective of level and context, Veenman (2013, 302) recommends that teachers consider the WWW&H rule as: what to do, when and why, and how before engaging on a metacognitive skills development with students. It therefore follows that any metacognitive skills development instruction within HE should be carefully planned and not simply ‘bolted-on’ without being integrated into other developmental and support mechanisms provided by universities.

 Until now research on developing metacognitive awareness has focussed primarily on quantitative analyses of students’ perceptions and actual performance (Schraw & Dennison, 1994; Schraw, 2009; Bol et al. 2010; Efklides, 2011; Lindsay & Nagel, 2015). In particular, Bol et al. (2005) claim that an accurate calibrated measure can be obtained through the calculation of a differential score between these two variables. A number of researchers have developed questionnaires to calculate this imagined differential score, most notably Nuhfer and Knipp, (2003) with their version of a ‘knowledge survey’, and Efklides (2011) in the Metacognitive Affective Model. Once the differential score is obtained, individual support can be put in place, it is asserted- but it this a true representation of how students learn? Is there a possible alternative approach to understanding how students arrive at their view of themselves as learners?

*Learning diaries as a metacognitive tool:*

Klug et al. (2011, 58) report that:

‘Diaries have proven their usefulness in research on self-regulated learning due

to their application as an instrument for recording learning processes and for

evaluating the results. Due to their structuring influence on the learning sessions, they serve as a self-instructional tool for documenting and reflecting learning processes. They help self-diagnosing learning behaviour and therewith initiate adaptations in learning behaviour that lead to better performance.’

Learning diaries are well established throughout all levels of education, from the schools sector to doctoral research. Claxton (2007) in particular has developed the idea of a learning diary to provide greater structure of schoolchildren’s learning, and the learning diary, or a ‘log of actions’, has been part of study programmes in the United Kingdom, such as the Extended Project Qualification, and a range of vocational qualifications where reflection on progress is required. Moreover, for Roth et al. 2014, 6), one notable feature of learning diaries ‘is their high ecological validity, since they capture actual learning processes’. Not only do learning diaries provide relatively high ecological validity, they are suited to longitudinal research and give real-time insights into students’ sense of progress during their learning journey, and for Schmitz and Wiese (2006) serve as an effective way of engendering metacognition. For Panadero et al. (2015, 3) the on-going reflection about their actions through the diary has an effect on the students’ prospective learning actions. Therefore, the diary is not only a measurement tool but also an intervention’. Arsal (2010) reported that keeping a diary had impacted positively on trainee-teachers’ metacognitive strategies and this finding reflected research elsewhere on the benefits of learning diaries (Taylor & Corrigan, 2005; Schmitz & Wiese, 2006).

 A number of researchers have recommended the use of structured learning diaries rather than open-entry unstructured diaries (Schmitz & Wiese, 1999; Klug et al., 2011; Panadero et al. 2015; Roth et al., 2015). For Dorrenbacher and Perels (2016, 53),

In the framework of SRL interventions, standardized learning diaries represent a structured method of initiating self-monitoring of learning…. They comprise the same items … to be completed before and after each learning phase. In accordance to Zimmerman’s cyclical SRL model (2000), items of the first part cover the forethought phase and those of the second part concern the action and reflection phase, which demonstrates that learning diaries reflect the whole SRL cycle’.

In particular, using structured diaries for recording students’ thoughts provide a time-specific form of measure, and establish a recognisable starting-point for discussion with students and subsequent intervention. Dorrenbacher and Perels (2016, 53) report that structured diaries ‘stimulate self-monitoring and therefore should cause behavioural optimisation processes’ [that support learning]. For Panadero et al. (2015), ‘they serve as a self-instructional tool for documenting and reflecting upon learning processes…. They permit close to real-time recording of learning processes with fewer reminiscence errors or palliations than other self-reports carry and are known to have high ecological validity because they are worked on in the natural learning environment’. Roth et al. (2015, 230) agree with Panadero at al. (2015) claiming that ‘studies using structured diaries indicate higher validity’ than those that used unstructured diaries. This reference to ecological validity in the literature is important for students as well as their teachers, and indeed researchers- it places learning in its spatial-temporal context and provides a sense of perspective for each individual student.

**Research methodology:**

*The context to research*

This research was undertaken at a nationally-recognised Business School in a post-1992 English University in the North East of England. The sample of students chosen were drawn from the first year of the undergraduate degree in Business Leadership and Corporate Management that typically recruits 30 students each academic year, and as such provided a convenient cohort to manage. Instead of the conventional three-year programme delivered from the lecture room, these students attend only the first year of their degree at University. Apart from four two-week intensive study periods at the university, the remainder of their degree is allocated to their work placement where they are required to demonstrate initiative and graduate-level skills. It is within this context that the benefits of students’ awareness of their power to learn and develop new skills are particularly relevant. It was this context that informed the research methodology.

 The two principal research questions that informed this research are how aware are students’ of how best to regulate their learning, and how can learning diaries be developed to enhance students’ metacognitive skills? In doing so, the findings may contribute to the wider literature on SRL and inform possible interventions within HE to improve learning and teaching.

*Moving to new methods of investigation in SRL research*

 Panadero, Klug and Jarvela (2015) trace the evolution of a range of research methodologies and their instruments over the past two decades as ‘three waves’, and suggest some reappraisal of how we approach SRL research is needed. The first wave, according to Panadero et al. (2015) was characterised by the use of questionnaires, such as the Motivated Strategies Learning Questionnaire (MSLQ), Learning and Study Inventory Questionnaire (LASSI) questionnaires developed by Pintrich, Smith, Garcia, and McKeachie (1993), and Weinstein, Schulte and Palmer (1987), respectively. For Panadero et al. (2015, 2) such instruments possessed a major weakness in that, ‘these trait-like instruments are not tailored for interventions as they do not capture changes in students’ strategies that are induced by specific interventions’. The changes that took place within much of SRL theory at the turn of the century led to a re-evaluation of SRL as essentially trait-based in favour of viewing learning as a process. As a consequence, the validity of earlier instruments has been called into question (Roth et al. 2014). This second wave of research approach focussed on the idea that we should look at what students do during the learning process and how they regulate their learning. Therefore, research has explored the benefits of ‘thinking aloud’ protocols or participant observation as alternative ways of obtaining insights into students’ behaviours. According to Panadero et al. (2015, 8), we are now entering a third wave of SRL research, in which we can see the development of ‘measurement+intervention’ instruments that are capable of providing insights into how students engage in SRL and enable assessment of their progress as a result of interventions.

 The changing nature of SRL research from trait to process-based analysis not only requires that we revisit the questions that have conventionally been posited but also the methodology adopted to obtain data. The shift towards qualitative methods of inquiry reflects the changing focus of SRL research and although Panadero et al. (2015, 8) acknowledge the convenience of Likert-style questionnaires, they report a concern from Schmitz, Klug and Hertel (2012) that questionnaires could generate an unrepresentatively small ‘reactivity effect’ in students’ responses. Furthermore, for Roth et al. (2014, 4), Likert-based questionnaires can distort data as these instruments lead the respondent to a response, and ‘it remains unclear whether participants only recognise and cite strategies that they feel are useful or report strategies that they actually use’. For Panadero et al. (2015, 8) the benefits of adopting qualitative research instruments are clear: ‘the advantages of a more qualitative approach, like provoking deeper reflection… could be considered more important’. Roth et al. (2014, 5) note that: ‘such qualitative standards have been applied rarely in higher education studies. This is unfortunate, as demands on students in higher education are comparatively high, making the choice, and thus definition, of appropriate strategies necessary’. The benefits of using an qualitative approach should be better recognised given the evolution of SRL research.

*The learning diary as a research instrument*

 In order to verify the reported benefits of using a structured learning diary over an extended period, learning diaries were issued to students at two points during their degree. The first occasion was at the very start of their degree during a six-week introductory module. The second occasion where a learning diary was issued was at their mid-point of the degree during a two-week intensive study block at the university. The learning diary was structured on the basis of three reflective comments that were aligned to three important learning goals as described below in Table 2. Each table equated to a full page of A4 paper, although students were not required to fill the entire page, they were asked to make a comment where they thought appropriate for each week of the module. In this way the nature of the data generated by the diary was conditioned by the three learning foci (theoretical models, practice and real-life examples) and the degree to which students felt comfortable with this subject content.

|  |  |  |  |
| --- | --- | --- | --- |
| **Week no.**  | **I now understand….** | **I need to find out more about….** | **I need to ask about….** |
| Concepts/ theoretical models |  |  |  |
| Practical aspects of theory in action |  |  |  |
| Real-life examples of organisations |  |  |  |

Table 2. A representation of the learning diary page.

The approach adopted echoes the phenomenographic methodology advocated by Prinsloo, Slade and Galpin (2011), as well as Booth (1997), Saljo, (1997), Trigwell, (2006) and that aims to describe ‘the qualitative different ways in which something is experienced’ (Saljo, 1997, p.176). The key research goal here was therefore to ‘highlight the variations exemplified by individual respondents’ (Prinsloo, et al., p.8). During the first phase of the research in year one, the structured diary included a pre- and post- test set of statements, as described in Table 3 below and which can be used to record changes in students’ perspectives. This pre- and post-test component of the learning diary involved five statements that represented a hierarchy in the levels of students’ confidence. For example, the statement lowest in the hierarchy read: ‘I am very worried about this module and am concerned that I will fail’; and the highest read as: ‘I am confident that I will achieve highly on this module and have no specific concerns about the subject content or the assignment’. The five statements are presented below in Table 3. Although the use of pre- and post-test statements may provide an insight into how students feel about their performance, the technique itself is not without limitations. As Boyas, Bryan and Lee (2012, 428) recognise, post-testing tend to indicate some improvement, and that ‘a response-shift bias can occur when students are self-evaluating their skills prospectively without a real understanding of the skills they are evaluating…. [and that] results presumes that the frame of reference of the student has not been altered by the course content, hardly a realistic assumption’. Nevertheless, pre-and post-testing is useful in that it raises awareness of learning diaries, provides some insight into how students report their level of confidence, as well as serving as a prompt for discussion within the focus groups.

|  |  |  |
| --- | --- | --- |
|  | **Statement**  | **Hierarchy of confidence** |
| 1 | *I am very confident that I will achieve highly on this Module and have no specific concerns either about the subject content or the assignment.* | ***Highest*** |
| 2 | *I am aware that there are some areas of the module that I will need to revise prior to writing the assignment.* |  |
| 3 | *I will need to revisit the subject content at length and plan the assignment prior to writing it up.* |  |
| 4 | *I am quite concerned that I may underachieve on this Module, but with support will pass.*  |  |
| 5 | *I am very worried about this module and am concerned that I will fail.* | ***Lowest*** |

Table 3. Statements offered to students in the pre- and post- test.

Korotitsch and Nelson Gray (1999) reported that not only did the use of a structured diary support the learning process, it also provided better insight into the nature of the ‘reactivity effect’ amongst students. For Panadero et al. 2010, 726), ‘the reactivity effect occurs when students reflect on their performance- that is, the difference between the established goals and the final results- via the diary that serves a self-observation purpose via recording what has happened from the student’s point of view’. Moreover, Schmitz and Wiese (1999) and Arsal (2010) found that there were also higher levels of student satisfaction and confidence as a result of using diaries.

*Analysis of data generated by learning diaries*

The comments made by students were analysed using thematic content analysis as described by Nevalainen, Mantyranta and Pitkala (2010). In this manner, the diaries were read and then re-read in order to identify ‘their inner experiences and reflections on these’ (Nevalainen, et al., 2010). This is no easy task as students often refer to several key codes in the same sentence. An iterative approach, wherein the data were repeatedly compared during the sifting process, followed that suggested by Silverman (2000). As a consequence, the sifting of data eventually coalesced into distinctive thematic codes such as ‘planning’ and ‘confidence’.

*Using focus groups as a research instrument*

 The distribution of learning diaries was supplemented by the decision to set up a two focus groups to obtain the views of students. The use of learning diaries and focus groups over a period of two years provided some degree of triangulation over time. In her research into the use of learning diaries by undergraduates in a Business School, Travers (2011, p. 207) recommends the use of focus groups because this approach provides a phenomenological understanding of students’ lived experiences and acts as a ‘possible check for validity’ by comparing this data with that drawn from the qualitative comments. Although the use of groups is not new, focus groups have typically been used as comparative units for quantitative measurement (Zimmerman & Martinez-Pons, 1998), in an qualitative study such as this, the primary function of focus groups is to generate rich data. For Carey (2016, 731) the main appeal of focus groups is that it captures ‘the synergy arising from interactions of the members, which encourages participation’, which is especially important in a quiet cohort such as these first semester undergraduates. Albeit that Tseng, Doernyei, & Schmitt (2006) report the use of focus groups in their research, relatively few SRL researchers have decided in favour of utilising focus groups in their research instead of the more commonly used MSLQ and LASSI questionnaires. These groups were anticipated to act in a complementary (Kitzinger, 1994) fashion as the secondary research instrument to the learning diary. The sample size approximated to that recommended by Bryman (2001, 340), who reported that seven was a typical sample size for a focus group in his analysis of a range of studies using this research instrument. In the first year of their degree, seminar periods were set aside for student support and reflection on the course itself provided an ideal meeting point for the two focus groups.

 Asking focus groups the right questions is key to their usefulness. The groups were asked about their understanding of learning diaries, how they approached study in their first semester at university and the challenges that they had faced in their first 6 weeks as undergraduates. As Bryman (2001, 338) explains, focus groups are particularly useful in providing an insight into the way people feel and often generate a range of views on a topic. Given the intention to ascertain the reflections of students after their use of learning diaries, such an approach is justifiable. During their second-year study block, the cohort was asked again for their thoughts as a group and a ‘word cloud’ (see figure 2 below) issued that included key terms drawn from Zimmerman’s SRL model, such as planning, fear of failure, goal-setting and motivation, which was used to elicit responses. The inclusion of references to ‘reflecting on how well I have done, and why’ and ‘improving my study’ were anticipated to generate responses linked to metacognition and calibration in particular. There are, however, limitations to this particular approach that are recognised in the literature (Carey, 2016) and addressed. In particular, the potential for some form of ‘distortion effect’ (Asch, 1957) either from the researcher of from a dominant individual within the group was taken into account and students were briefed on the ‘rules of interaction’ and the etiquette of focus groups dynamics. Despite its limitations, the decision to use focus groups was justified by the wealth of responses generated.

*Planning my study Worry about the assignment*

*Interest in assignment Setting my short-term goals*

*Prompting me to ask for help Time management*

*Helping with self-confidence My general level of motivation*

*Reflecting on how well I have done, and why*

*As a record of work As a way of improving my study techniques*

Figure 2. A ‘word cloud’ that was used as a prompt for possible feedback from students.

**Findings and discussion:**

*How aware are students’ of how best to regulate their learning?*

Ascertaining how students undertake calibration of their learning is a key focus for this paper. As life-long learners capable of identifying their strengths and weaknesses, students should be encouraged to practise self-evaluation and explore new approaches to study. SRL is predicated on the idea that students actively manage their learning and evaluate their performance through metacognition. In doing so, students are expected to develop their metacognitive skills throughout their life-long journey as learners. The findings infer that, although students have an insight into how they ordinarily approach study, their understanding is principally informed by their personal history, which equates with metacognitive experience and mastery. The findings suggest that although students may have a developed sense of metacognitive experience/mastery, as defined by Efklides (2001), they have a less effective form of metacognitive knowledge, and even less awareness of how develop their metacognitive skills. The social context to learning, as identified both by Bol et al. (2005) and Goudas et al. (2013), is important given these findings. In such circumstances, the benefits of the teacher or peer support networks in scaffolding learning, or supporting the student, should be considered as one way in encouraging students to reflect more effectively. In addition, it appears that those students who lacked confidence or low esteem were more likely to report some benefits in using a learning diary. This finding echoes the research of Jiang and Klietman (2014) who reported that strategies that bolstered self-esteem were more likely to improve students’ ability to calibrate.

|  |  |  |  |
| --- | --- | --- | --- |
| **Performance phase** | **Metacognitive aspect** | **SRL phase process** | **Finding (indicative comments)** |
| ***Forethought*** | ***Metacognitive mastery / knowledge*** | ***Task analysis*** |  |
|  | *Primarily associated with the identification of goals* | Goal setting | ‘Need to ask my manager at … about their interview process’.‘Watch the stakeholder theory on YouTube’‘Make sure I understand all theorists and their opinions. Look over case studies [and]strategic analysis’. |
|  |  | Strategic planning | ‘I need to create a pilot of my proposed innovation and figure out all the possible problems and plan a way to overcome this’.  |
|  |  | ***Self-motivation beliefs*** |  |
|  |  | Self-efficacy | ‘I now understand the concept of an innovation and the factors that need to be considered before the change can be introduced’. |
|  |  | Outcome expectations | No comments |
|  |  | Task interest / value | ‘I often feel demotivated to continue working when I can’t find a practical example of theory’ |
|  |  | Goal orientation  | ‘Not very good with technology but want to make the poster good & imaginative’. |
|  |  |  |  |
| ***Performance phase*** | ***Metacognitive skills*** | ***Self-control*** |  |
|  | *Primarily concerned with identifying learning strategies / actions*  | Task strategies | ‘Make sure I understand all theorists and their opinions. Look over case studies [and]strategic analysis’.  |
|  |  | Self-instruction | ‘Read over Fundamentals of Strategy [textbook] pages 1-18 for help on this’.‘Structuring my poster with regards to using Adobe Illustrator’. |
|  |  | Imagery | No comments |
|  |  | Time management | Data infers students do view learning diaries as an organising aid |
|  |  | Environmental structure | No comments |
|  |  | Help-seeking | ‘I need to ask about the different models and theoretical framework that conflict against my personal beliefs- see if I can interpret the information from a different angle’. |
|  |  | Incentives  | No comments |
|  |  | **Self-observation** |  |
|  |  | Metacognitive monitoring | Data infers students do use the learning diary to monitor their progress |
|  |  | Self-recording | No comments |
|  |  |  |  |
| ***Self-reflection phase*** | *Primarily concerned with self-assessment* | ***Self-judgment*** |  |
|  |  | Self-evaluation | ‘I now understand how my feelings and emotions can change and be impacted about the certain theory that I read’. |
|  |  | Causal attribution | No comments |
|  |  | ***Self-reaction*** |  |
|  |  | Self-satisfaction  | No comments |
|  |  | Affective response | ‘I now understand how theory can be embedded to support my thoughts and feelings’. |
|  |  | Adaptation | ‘Where the theory does not complement my feelings I need to find out why this is’. |
|  |  | Defensive response | No comments |

Table 4. An overview of the key findings in relation to Zimmerman’s SRL model.

*How can learning diaries be developed to enhance students’ metacognitive skills?*

The data generated by students’ learning diaries not only reflected the perceived value of the exercise but also their self-efficacy as new undergraduate students. Research has demonstrated a link between self-efficacy and the approach taken by students in learning (Bandura, 1997; Zimmerman, 2000; Zuffiano, Alessandri, Gerbino, Kanacri, Di Giunta, Milioni, & Caprara, 2012; Komarraju & Nadler, 2013). Those students with a higher level of self-efficacy believe that classroom activities are inherently worthwhile and lead to enhanced performance. Those students with lower levels of self-efficacy tend to believe that they will under-perform and approach activities with lower levels of confidence and commitment. Ultimately, as Dweck (1999) describes, students’ conceptions of self-efficacy is tied to their view of their own intellect and capacity to learn. For those students who believe that their capacity to learn is constrained, the appeal of a learning diary is somewhat limited. For those students who do not see a limit to their potential, then there may be greater value in maintaining a learning diary. As Komarraju and Nadler (2013) report, these viewpoints reflect either an ‘entity’ or an ‘incrementalist’ perspective of learning. Those students who subscribe to an incrementalist view of learning not only possess relatively high levels of self-efficacy, and intrinsic motivation, also display more effective metacognitive skills compared to those who adhere to an entity perspective of their potential for intellectual growth.

 The learning diary was structured in order to provide both a pre and post-test of students’ level of confidence. The pre-and post-test was based on the selection by the student of one statement from five options, such as ‘quite concerned that I may underachieve’, that described their view of their self-efficacy at that point in time. In comparing how students identified with any one of the statements before and after the research, it is possible to derive some form of qualitative measure of their self-efficacy. The use of pre and post testing is well-established in the literature (Woolcock, Creevy, Coleman, & Brown, 2016) as a measure of students’ changing perspectives on their progress over time. The findings infer that students generally become more confident in their work as a result of using a learning diary. This data suggests that students had settled down to the demands of their first semester as an undergraduate- and this is reflected in their diary entries. Those who did not report an increase in their level of confidence already held high expectations of their ability at the start of the course, and the entries reflect their high level of self-efficacy and confidence. This research suggests that the possible benefits of maintaining a learning diary appeal more to those with lower levels of confidence. Those students who reported concerns with their potential to succeed were more likely to maintain the diary, and make comments that are more detailed. With a number of respondents upgrading their self-diagnosis in the pre-test from being ‘quite concerned that I may underachieve’ to a more assured ‘I need to plan for the assessment’ in the post-test, it appears that some students increased their level of confidence as a consequence of using the learning diary. Almost half of the total number of respondents indicated that their awareness of what was required had improved as a result of maintaining a diary. Importantly, the data also shows that those who had reported the greatest progress had engaged more proactively with the learning diary than those students who had not. An analysis of the frequency and detail of comments made in the learning diaries showed that those who had made entries for each week of the course reported improved levels of confidence. Those students who reported no increase in their level of confidence, and who already possessed high levels of self-efficacy, made on average half the entries compared with those with lower levels of self-confidence. Such findings suggest tentatively that learning diaries not only provide a means by which students can engage in metacognition, but may also contribute to increased levels of confidence in their potential to succeed.

 In terms of possible limitations to this study, several issues emerged. There was significant drop-out from the course as the consequence of not securing work placements and only 15 contributed to the second phase of the research. Although the sample size is not large, others have reported research based on smaller samples. For example, Prinsloo, Sklade and Galpin (2011) reported on the use of learning diaries with a sample of 12 students. For positivist researchers, this would be a major concern as they look for generalisability of findings. However, for non-positivists, the size of sample is less important as they search for ‘meanings and the way people understand things’ (Denscombe, 2002, 207). In this respect, the findings are valid as they provide an authentic insight into the thoughts of those students who participated in the research (Bryman, 2001; Saunders, Lewis, & Thornhill, 2000). The utility of learning diaries should be reviewed and compared to other possible ways of eliciting reflection from students. In particular, alternative forms of recording and reflection exist, such as e-portfolios. Indeed, e-portfolios are more varied in their functionality and may be preferred by technophile students. Finally, one student voiced a preference for one-to-one tutorials as a more effective means of reflection, support and development. Such feedback is useful as it places this current study into a more balanced context that recognises the diversity in learning preferences that exist and the alternatives for consideration.

 The feedback from focus groups returned similar data to the learning diaries. The key issues that emerged were: the benefits in identifying areas for revision; promoting reflective thinking and more critical analysis of what had been learnt in class; re-enforcing the importance of planning for the future through effective time-management. In terms of Zimmerman’s model of SRL, however, three sub-processes were prominent: Interest in the assignment, setting short-term goals, and prompting to ask for help. Although one student thought that maintaining a learning diary was a waste of time that could be spent on reading, the general response indicated that students saw some value in having used a structured learning diary during their time at university.

**Conclusion:**

This investigation suggests that there is some benefit to be had for students in maintaining a learning diary as a way of developing their metacognitive awareness and support action planning. This research contributes to the corpus of evidence (Veenman, 2013) that suggests that students can be inducted into behaviours that will develop their metacognitive skills and, in doing so, their potential for life-long learning. In particular, this research may contribute to the research undertaken into how first semester undergraduates manage the challenges associated with the transition from school to university. This approach could also be extended to other undergraduate study programmes where students are required to spend part if the degree in a workplace environment. There are, of course, limits to the transferability of this relatively small-scale research project and its conclusions. SRL theory offers educationalists a theoretical framework within which a better understanding of learning many be conceived. For Panadero et al. (2015) SRL research has entered into the ‘third wave’ of research methodology, in which the focus of investigation is not simply how to measure changes in students’ behaviours, but also explore possible intervention strategies that will improve their strategic approaches to learning. Until recently, an overwhelming proportion of researchers have adopted a quantitative approach based on the use of the established research instruments, such as LASSI and MSLQ questionnaires, underpinned by positivist notions of knowledge. This research sought to establish an interpretivist approach to investigating metacognition that dispensed with quantitative conceptions of understanding and adopted a qualitative approach based on an understanding of how students responded to the use of learning diaries as a means of managing their learning. If one is to search for further generalisability from this research, it may well be how this ‘third wave’ approach can be applied to other contexts, and where its emphasis on qualitative research methods would prove enlightening.

 The findings also infer that there is an important role to be played by the teacher in the design and implementation of interventions. Azevedo, Greene and Moos (2007) recommend that a member of staff be available to present and manage the intervention process, and this advice was mirrored in the research with students asking for clarification and some degree of reassurance of the activity. It is important that the context and anticipated benefits of using intervention strategies such as learning diaries be communicated to students and placed within their own learning journey. Although Gutierrez and Schraw (2015) contend that benefits may accrue after only one-hour of instruction, the findings from this research suggest that once launched, learning diaries should be monitored on a regular basis to ensure that students maintain their entries. Students do engage in the calibration of their learning to differing degrees, as suggested by SRL theory. The findings suggest that students are less skilled in managing those SRL sub-processes associated with self-judgment than planning, and the wider literature tends to echo this observation. Future research could usefully explore how students could be encouraged to become more self-evaluative. Much research has explored the impact of motivation (Covington, 2004), self-efficacy (Zimmerman, 2000; Komarraju & Nadler, 2013; Woolcock et al. 2016) and affective (Dweck, 1999; Efklides, 2011) factors in the complex process of learning, and much still needs to be done to isolate the respective impact of such factors. Importantly, this research indicated that those with the lower levels of self-confidence and self-efficacy engaged with the learning diaries more that those with high levels of self-efficacy, and they reported more progress in their growth as learners. If learning diaries are to become truly effective, then students need to demonstrate an understanding of their value and commit to their use.

**References:**

Al Khatib, S. A., (2010). Metacognitive self-regulated learning and motivational beliefs as predictors of college students’ performance. *International Journal for Research in Education, 27*, 57-72.

Arsal, Z. (2010). The effects of dairies on self-regulation strategies of pre-service science teachers. International *Journal of Environmental & Science Education, 5,* 1, 85-103.

Artelt and Neuenhaus (2010). Metacognition und Leistnug. In W. Bos, E. Kliene, & O. Koeller (Eds.), *Schulische lerngelegenheiten and Kompetenzentwicklung. Festschhrift fuer Juergen Baumer* {Learning opportunities in school and competency development. A commemorative publication for Juergen Baumert] (pp127-146). Munster, Germany: Waxman.

Asch, S. E. (1957). Effect of group pressure upon the modification and distortion of judgments. In H. Guetzow (Ed.), *Groups, leadership and men.* Pittsburgh: Carnegie Press.

Azevedo, R., Greene, J. A., & Moos, D. C. (2007). The effect of a human agent’s external regulation

upon college students’ hypermedia learning. *Metacognition and Learning, 2,* 67-87.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood

Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self*-efficacy*: The exercise of control.* New York, NY: Freeman.

Barnard- Brak, L., Lan, W. Y., Paton, V. O. (2010). Profiles in self-regulated learning in the online learning environment. *International Review of Research in Open and Distance Learning, 11*, 1, 61-80.

Bembenutty, H. Cleary T.J. & Kitsantas, A. (Eds.) (2013). *Applications of Self-regulated learning across diverse disciplines.* Charlotte, NC: Information Age Publishing.

Boekaerts, M. (1997). Self-regulated learning: Where are we today. *International Journal of Educational Research, 31*, 6, 450-453.

Bol, L., Hacker, D.J., O’Shea, P., & Allen, D. (2005). The influence of overt practice, achievement level, and explanatory style on calibration accuracy, and performance. *The Journal of Experimental Education, 73*, 269-290.

Bol, L., Riggs, R., Hacker, D. J., Dickerson, D.& Nunnery, J. (2010). The calibration accuracy of middle school students in math classes. *Journal of Research in Education, 21,* 81-96.

Booth, S. (1997). On phenomenology, learning and teaching. *Higher Education Research & Development, 16,* 2, pp. 135-158.

Boyas, E., Bryan, L. D., & Lee, T. (2012). Conditions affecting the usefulness of pre-and post-tests for assessment purposes, *Assessment & Evaluation in Higher Education, 37*, 4, 427-437. DOI. 101080/02602938.2010.538665.

Boyer Commission on Educating Undergraduates in the Research University (1998)

*Reinventing undergraduate education: a blueprint for America’s research universities.* Stony

Brook: State University of New York at Stony Brook.

Bryman, A. (2001). *Social Research Methods*. Oxford: Oxford University Press.

Carey, M. A. (2016). Focus groups- what is the same, what is new, what is next? *Qualitative Health Research, 26*, 6, 731-733.

Chen, P., P. (2003). Exploring the accuracy and predictability of the self-efficacy beliefs of seventh-grade mathematics students. *Learning and Individual Difference, 14,* 1, 77-90.

Chen, P., P. & Rossi, P., D. (2013). Utilising calibration accuracy information with adolescents to improve academic learning and performance. In H. Bembenutty, T. J. Cleary & A. Kitsantas (Eds.) *Applications of self-regulated learning across diverse disciplines*. (pp. 263-298). Charlotte, NC: Information Age Publishing.

Claxton, G. (2007). Expanding young people’s capacity to learn. *British Journal of Educational Studies 55* (2): 1–20.

Covington, M., V. (2004). Self-worth theory goes to college: Or do our motivation theories motivate? In D. M. McInerney & S. Van Etten (Eds.), *Big theories revisited: Research on sociocultural influences on motivation and learning*, Volume 4, (pp. 91-114). Greenwich, CT: Information Age Publishing.

Cox, E. (2005). Adult learners learning from experience: using a reflective practice model to support work-based learning, *Reflective Practice, 6*, 4, 459-472.

Denscombe, M. (2002). *The good research guide for small-scale social research participants,* Buckingham: Open University Press.

Dorrenbacher, L. & Perels, F. (2016). More is more? Evaluation of interventions to foster self-regulated learning in college. *International Journal of Educational Research, 78,* 50-65. [DOI.org/10.1016/j.ijer.2016.05.010](https://doi.org/10.1016/j.ijer.2016.05.010)

Dresel, M., Schmitz, B., Schrober, B., Spiel, C, Ziegel, A., Engelschalk, T., Joestl, G., Roth, A., Wimmer, B., & Steuer, G. (2015). Competencies for successful self-regulated learning in higher education: Structural model and indications drawn from expert interviews. *Studies in Higher Education, 40,* 3, 454-470.

Dweck, C. S. (1999). *Self theories: Their role in motivation, personality, and development*, Philadelphia, PA: The Psychology Press.

Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning: The MASRL model. *Educational Psychologist, 46,* 6-25.

Flavel, J.H. (1979). Metacognition and cognitive monitoring. *American Psychologist, 34,* 906-911. DOI. 10.1037/0003-066X.34.10.906.

Fluckiger, J., Tixier y Vigil, Y., Pasco, R., & Danielson, K. (2010). Formative feedback: involving students as partners in assessment to enhance learning, *College Teaching, 58*, 4, 136-140.

Goudas, M., Kolovelonis, A., & Dermitzaki, I. (2013).Implementation of self-regulated interventions in Physical Education. In H. Bembenutty, T. J. Cleary & A. Kitsantas (Eds.) *Applications of self-regulated learning across diverse disciplines*. (pp. 383-416). Charlotte, NC: Information Age Publishing.

Gutierrez, A. P. & Schraw, G. (2015). Effects of strategy training and incentives on students’ performance, confidence, and calibration. *The Journal of Experimental Education, 83*, 3, 386-404.

Hacker, D. J., Bol, L. & Keener, M.C. (2008). Metacognition in education: A focus on calibration. In J. Dunlosky & R. Bjork (Eds.), Handbook of memory and metacognition (pp. 429-455). Mahwah, NJ: Lawrence Erlbaum.

Healey, M. & Jenkins, A. (2009). Developing undergraduate research and inquiry, York: Higher Education Authority.

Helyer, R. (2015). Learning through reflection: the critical role of reflection in work-based learning (WBL), *Journal of Work-Applied Management, 7*, 1, 15-27.

Hillman, N., &Robinson, N. (2016). *Boys to Men: The Underachievement of Young Men in Higher Education and How to Start Tackling It.* Number 84, Higher Education Policy Institute. Retrieved from: <http://www.hepi.ac.uk/2016/05/12/3317/>

Huff, J.D. & Nietfield, J. L. (2009). Using strategy instruction and confidence judgments to improve metacognitive monitoring. *Metacognition Learning 4*, 161-176.

Lindsay, B. A., & Nagel, M. I. (2015). Do students know what they know? Exploring the accuracy of students’ self-assessments. Physical Review, Special Issue, *Physics Education Research*, *11,* 1 020103-1 – 020103-11. DOI.1-0.11.03/physRevSTPER.11.020103.

Jiang, K., & Klietman, S. (2014). Metacognition and motivation: Links between confidence, self-protection and self-enhancement, *Learning and Individual Differences*, DOI. 10.1016/j.Indif.2014.11.025.

Karlen, Y. (2016). Differences in students’ metacognitive strategy knowledge, motivation, and strategy use: A typology of self-regulated learners, *The Journal of Educational Research, 109,* 3, 253-265. DOI.10.1080/00220671.2014.942895.

Kitsantas, A., Winsler, A., & Huie, F. (2008). Self-regulation and ability predictors of academic success during college. A predicative validity study. *Journal of Advanced Academics, 20*, 42-68.

Kitzinger, J. (1994). The methodology of focus groups: The importance of interaction between research participants. *Sociology of Health & Illness, 16*, 103-121.

Kleitman, S., and Stankow, L. (2007). Self-confidence and metacognition processes. *Learning and Individual Differences, 17*, 161-173.

Klug, J., Ogrin, S. Keller, S., Ihringer, A. & Schmitz, B. (2011). A plea for self-regulated learning as a process: Modelling, measuring and intervening, *Psychological Test and Assessment Modelling*, *53*, 1, 51-72.

Komarraju, M., & Nadeler, D., (2013). Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter? *Learning and Individual Difference, 25,* 67-72. <http://dx.doi.org./10.1016/jlindif.2013.01.005>

Korotitsch, W., & Nelson Gray, R., O. (1999). An overview of self-monitoring research in assessment. *Psychological Assessment, 11*, 4, 415-425.

Krueger, J. & Mueller, R. A. (2002). Unskilled, unaware or both? The better-than-average heuristic and statistical regression predict errors in estimates of one’s own performance. *Journal of Personality and Social Psychology, 82,* 2,180-188.

Kruger, J. & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognising one’s own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology, 77,* 6, 1121-1134.

Nevalainen, M.K., Mantyranta, T., and Pitkala, K.H. (2010). Facing uncertainty as a medical student- A qualitative study of their reflective learning diaries and writings on specific themes during the first clinical year, *Patient Education and Counselling, 78,* 218-223. DOI. 10.1016/j.pec.2009.07.011.

Nietfield, J. L. (2006). The effect of distributed monitoring exercises and feedback on performance, monitoring accuracy, and self-efficacy. *Metacognition and Learning, 1,* 159-179.

Nelson, T.O. & Narens, L. (1994). Why investigate metacognition? In J. Metcalfe & A.P. Shimamura (Eds.), *Metacognition: Knowing about knowing* (pp. 1-25). Cambridge, MA: MIT Press.

Ning, H. K. & Downing, K., (2015). A latent profile analysis of university students’ self-regulated learning strategies. *Studies in Higher Education, 40*, 7, 1328-1346.

Nuhfer, E., & Knipp, D. (2003). The knowledge survey: A tool for all reasons. *To Improve the Academy. 21*, 59-78.

Pajares, F. & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. *Contemporary Educational Psychology, 24*, 124-139.

Panadero, E., Klug, J., & Jarvela, S. (2015). Third wave of measurement in the self-regulated field: When measurement and intervention come hand in hand. *Scandinavian Journal of Educational Research,* DOI. 10.1080/00313831.2015.1066436.

Pintrich, P.R. (2000). The role of motivation in promoting and sustaining self-regulated learning. International Journal of Educational Research, 31, 459-470.

Pintrich, P.R. & de Groot, E. (1990).Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 1 33-50.

Pintrich, P. R., Smith, D., A., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement, 53,* 3, 801-813.

Prinsloo, P., Slade, S., and Galpin, F. (2011). A phenomenographic analysis of student reflections in online learning diaries, *Open Learning: The journal of Open, Distance and e-Learning, 26,* 1, 27-38. DOI.10.1080/02680513.2011.538562

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlated of university students’ academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*, 353-387.

Roth, A., Ogrin, S. & Schmitz, B. (2014). Assessing self-regulated learning in higher education: A systematic literature review of self-report instruments. *Educational Assessment, Evaluation and Accountability*.DOI.10.1007/s11092-015-9229-2.

Saljo, R. (1997). Talk as data and practice- a critical look at phenomenographic inquiry and the appeal to experience. *Higher Education Research & Development, 16,* 2, pp. 173-190.

Saunders, M., Lewis, P., & Thornhill, A. (2000). *Research methods for business students*, Harlow: FT Prentice Hall.

Schmitz, B., & Wiese, B. (1999). A process study of self-regulated learning behaviour using standardised diaries. *Metacognition and Learning, 6,* 255-273.

Schmitz, B., & Wiese, B. (2006). New perspectives for the evaluation of training session in self-regulated learning: Time series analyses of diary data. *Contemporary Educational Psychology, 31*, 1, 83-88.

Schmitz, B. Klug, J., & Hertel, S. (2012). Collecting and analysing longitudinal diary data. In B. Laursen, T. D. Little, & L., A . Card (Eds.), *Handbook of developmental research methods* (pp. 181-195). New York: Guilford Press.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychologist, 19*, 46-475.

Schraw, G. (2009). Measuring metacognitive judgments. In D. J. Hacker, J. Dunlosky, & A.C. Graseer, (Eds.), Handbook of metacognition in education, (pp. 415-429). New York, NY: Routledge.

Schunk, D.H. and Zimmerman, B.J. (Eds) (1998). *Self-Regulated Learning: From Teaching to Self-Reflective Practice*, New York, NY. Guilford Press.

Schunk, D. H. & Usher, E. L. (2013). Barry J. Zimmerman’s theory of self-regulated learning. In H. Bembenutty, T.J. Cleary & A. Kitsantas (Eds.), *Applications of Self-regulated learning across diverse disciplines* (pp. 1-28). Charlotte, NC: Information Age Publishing.

Silverman, D. (2000). *Doing qualitative research. A practical handbook*, London: Sage.

Snyder, M. L., Stephan, W. G. & Rosenfield, D. (1978). Attributional egotism. In J. Harvey, W. Ickes, & R. Kidd (Eds.), *New directions in attribution research*, (Volume 2, pp. 91-117), Hillsdale, NJ: Erlbaum.

Sperling, R.A., Howard, B.C., Staley, R., & DuBois, N. (2004). Metacognition and self-regulated learning constructs. *Educational Research and Evaluation, 10,* 2, 117 -139

Taylor, N., & Corrigan, G. (2005). Empowerment and confidence: Pre-service teachers learning to teach science through a program of self-regulated learning. *Canadian Journal of Science, Mathematics and Technology Education, 5,* 1, 38-56.

Travers, C. (2011). Unveiling a reflective diary methodology for exploring the lived experiences of stress and coping, *Journal of Vocational Behavior, 70*, pp. 204-216. doi. 10.1016/j.jvb.2010.11.007

Trigwell, K. (2006). Phenomenography: An approach to research in geography education. *Journal of Geography in Higher Education, 30,* 2, pp. 367-372.

Tseng, W-T., Doernyei, Z. & Schmitt, N. (2006). A New Approach to Assessing Strategic Learning: The Case of Self-Regulation in Vocabulary Acquisition. *Applied Linguistics 27,* 1: 78–102. DOI:10.1093/applin/ami046.

Tuckman, B.W. & Kennedy, G.J. (2011). Teaching learning strategies to increase success of first-term college students. *The Journal of Experimental Education, 79*, 4, 478-504.

Veenman, M., V., J. (2013). Training metacognitive skills in students with availability and production deficiencies. In H. Bembenutty, T.J. Cleary & A. Kitsantas (Eds.), Applications of Self-regulated learning across diverse disciplines (pp. 299-324). Charlotte, NC: Information Age Publishing.

Virtanen, P., Nevgi, A. & Niemi, H. (2013). Self-regulation in higher education: Students’ motivational, regulational and learning strategies, and their relationships to study success. *Studies for a Learning Society*, *3*, 1-2, 20-36.

Vrught, A. & Oort, F.J. (2008). Metacognition, achievement goals, study strategies and academic achievement: Pathways to achievement. *Metacognition Learning, 30*, 123-146.

Vula, E., Avdli, R., Berisha, V., Saqipi, B., & Elezi, S. (2017). The impact of metacognitive strategies and self-regulating processes of solving math word problems, *International Electronic Journal of Elementary Education*, *10,* 1, 49-59. doi.10.26822/iejee.2017131886

Vygotsky, L. (1934/1986). *Thought and Language*. Cambridge, MA: MIT Press.

Walker, R., Cooke, M., Henderson, M. & Creedy, D.K., (2013). Using a critical reflection process to create an effective learning community in the workplace. *Nurse Education Today, 33*, 5, 504-511.

Weiner, B. (1986). *An attributional theory of motivation and emotion.* New York: Holt, Rinehart & Winston.

Weinstein, C., E., Schulte, A., C., & Palmer, D., R. (1987). *Learning and study strategies inventory*. Clearwater, FL.: H&H Publishing.

Winne, P.H. (2004). Students’ calibration of knowledge and learning processes: Implications for designing powerful software learning environments. *Educational Research, 41,* 466-488.

Winne, P.H. (2017). Cognition and metacognition within Self-Regulated Learning. In P.A. Alexander, D.H. Schunk & Greene, J.A., (Eds.) *Handbook of Self-Regulation of Learning and Performance*, (pp. 36-48). London: Routledge. DOI. 104324/9781315697048.

Woolcock, A., D., Creevy, K., E., Coleman, A., E., Moore, J., N., & Brown, A. (2016). Assessing academic self-efficacy, knowledge, and attitudes in undergraduate physiology students, *American Journal of Educational Research, 4,* 9, 652-657.

Zeegers, P. (2004). Student learning in higher education: A path analysis of academic achievement in science. *Higher Education Research & Development, 23*, 35-56.

Zimmerman, B.J. (1986). Becoming a self-regulated learner: Which are the key sub-processes? Contemporary Educational Psychology, 11, 307-313.

Zimmerman, B., J. (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. H. Schunk& B. J. Zimmerman (Eds.), *Self-regulation of learning and performance. Issues and educational implications* (pp 3-21). Hillsdale, NJ: Erlbaum.

Zimmerman, B., J. (2000). Self-efficacy: An essential motive to learn, *Contemporary Educational Psychology, 25,* 82-91.

Zimmerman. B.J. (2009). Self-regulation: Where metacognition and motivation intersect. In D.J. Hacker& J. Dunlosky (Eds.), Handbook of metacognition in education (pp.299-315). New York, NY: Routledge.

Zimmerman, B. J., & Martinez-Pons, M. (1998). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal, 80*, 284-290.

Zuffiano, A., Alessandri, G., Gerbino, M., Kanacri, B. P. L., Di Giunta, L., Milioni, M. & Caprara, G. V. (2012). Academic achievement: The unique contribution of self-efficacy beliefs in self-regulated learning beyond intelligence, personality traits, and self-esteem, *Learning and Individual Difference*, doi.10.1016/j.lindif.2012.07.010