

**Investigating the Implications
of Hattie's (2012) Synthesis of
Meta-Analyses for Teaching
Higher Education in Further
Education**

Teacher Education Advancement
Network Journal
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University of Cumbria
Vol 4 (3) page 59-76

Claire Lloyd, Robin Trangmar
claire.lloyd@gllm.ac.uk

Abstract

This paper investigates the implications of John Hattie's synthesis of over 800 meta-analyses for lesson design and delivery within the context of a teacher training programme.

A case study approach is used to structure a two-stage investigative strategy (Yin, 1981). Stage one involves an interpretive cycle that allows Hattie's attributes of effective practice to become meaningful through a consideration of the context in which they are applied. Stage two builds on the findings of this review to translate 'ways of thinking about teaching' into 'ways of teaching' that accommodate different goals and abilities in order to impact a range of student outcomes. This paper documents progress from the first stage of the analysis.

Through the investigation, effective teaching is represented as a process of evidence-informed inquiry and problem solving in which a cycle of reading, deliberation, and dialogue continues until a shared understanding emerges of the practices that enhance learning for individual students (Smythe et al., 2008). These practices include but are not limited to: providing feedback that takes students forward in their learning, using data on student learning to inform collaborative evaluations of teacher impact, and modifying teaching based on an informed consideration of the strategies that facilitate learning.

Results suggest that practitioners need to develop a shared commitment to thinking that is willing to engage with evidence and use this as the basis for questioning mindsets, critiquing existing practices, and exploring new ideas; and a commitment to action that is open to managing a complex process of change.

Key words

Hattie; visible learning; effect size; effective teaching; teacher education; PGCE/PCET

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Introduction

Efforts to enhance teacher effectiveness have long preoccupied the educational research community, with researchers generating a steady stream of interventions, innovations and initiatives that claim to improve student learning (Biesta, 2007). One of the most comprehensive attempts to come to grips with this evidence-base has been a 15 year project by John Hattie to translate the results of over 50,000 studies on the attributes of teaching that make a difference to student learning into a set of guidelines that facilitate effective practice. Since its initial publication in 2009, Hattie's work has been recognised as making a significant contribution to our understanding of the factors that influence student learning and has been identified as essential reading not only for researchers and policy makers but also teacher educators (Orlich, 2010; Snook *et al.*, 2009).

In this investigation we sought an understanding of the core attributes underlying Hattie's conception of effective teaching by interpreting them within the context of an HE teacher training programme. We also considered if the attributes could be used as Hattie intended: as 'guidelines' for evaluating the impact of teaching on student learning.

The Role of Evidence in Improving Practice

Much has been written about the role of research in improving educational practice. Early writers were concerned about the practical value of research in revealing 'what works' in education and for whom (Hargreaves, 1996; Biesta, 2007). However, there was a sense that the evidence produced was lacking in terms of its quality, had little practical relevance and was inaccessible to those who might apply it (both practitioners and policy-makers alike) (Hargreaves, 1996). Calls were made for research to be more rigorous and systematic so that education, like medicine, could become a practice-driven field (Biesta, 2007). To ensure rigour, researchers adopted methodologies that would demonstrate the effectiveness of educational interventions 'beyond reasonable doubt', typically through experimental and quasi-experimental studies (Scriven, 2005: 4). To ensure systematicity, researchers produced syntheses, or meta-analyses, which drew the findings of experimental studies into a common measure (i.e. effect sizes) so that overall impacts on learning could be determined (Evidenced Based Teachers Network ((EBTN)), 2012).

A Proliferation of Evidence

As the scope of research has extended, the characteristics of effective practice have expanded; and practitioners are now confronted with an ever-increasing array of strategies that claim to facilitate learning. Indeed Carpenter (2000) found 361 'good ideas' published over a decade in just one

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academic journal; while the EBTN (2012) identified over 900 meta-analyses on educational attainment. It is hardly surprising, therefore, that teachers and schools often find themselves overwhelmed with a plethora of interventions all claiming to make a difference to student outcomes (Carpenter, 2000). With the rise in practitioner-based research, the proliferation of on-line journals and the surge of blogs and tweets, sifting through the latest good ideas to determine 'what works best' is an increasingly challenging process. This problem not only impacts teachers and schools but also teacher training programmes. Indeed, Hollins (2011: 395) recently reported that programmes are often characterised by 'fragmentation, weak pedagogy, and a lack of articulation among courses and between courses and field experiences, as well as the absence of a set of organising themes, shared standards, and clear goals'.

Managing Evidence through a Synthesis of Meta-analyses

In *Visible Learning* (2009a) Hattie seeks a way through the morass. Synthesising the results of over 800 meta-analyses, he identifies those aspects of schooling that have the greatest impact on learning. Evidence is collected across all phases of education but is dominated by the school sectors (Atherton, 2011). Nevertheless, Hattie draws out the results relating to higher education and is confident that 'what works in schools also works in universities' (Hattie 2009b: 9). (A full list of results is included in Appendix 1.) Emerging from the synthesis is 'an explanatory story' of successful teaching and learning (Hattie, 2009a: 243). In *Visible Learning for Teachers* (2012), Hattie translates this story into 43 attributes of effective practice, which form an organising structure from which to plan the improvement of learning (Hattie, 2012). Teachers are encouraged to use their professional judgement to evaluate how the attributes and associated evidence speaks to their practice. Hattie's reliance on teacher judgement represents a conception of educational research as evidence-informed practice, rather than the more traditional evidence-based practice whereby the results of research supply 'rules for action' (Biesta, 2007: 5 & 17). In other words, he recognises the complex ways in which research might influence teaching and lets practitioners decide the nature of that influence based on the determining features of their context.

Methodological Concerns with Meta-analyses

While recognising the importance of context, it is the complexity of the classroom life that poses perhaps the greatest concern when using Hattie's framework to guide practice. Difficulties centre around his use of meta-analyses to inform the evidence base (Snook *et al.*, 2009). Methodological concerns about meta-analysis in the social sciences are not new and have provoked considerable debate. While a review of these issues is beyond the

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scope of this paper, one of the most significant issues, acknowledged by both its detractors and proponents, is that statistical procedures cannot adequately capture the complexity of the social world (Glass, 2000). Lee Cronbach (1982: 70), for example, argues that a reliance on averages reduces the social 'terrain' to a 'featureless, flat, with no interesting interactions or topography'. To get beyond these issues one of the founders of meta-analysis, Gene Glass, suggests moving closer to the evidence, by amassing archives of raw data via the internet, rather than moving even further away, which Hattie's synthesis of averages inevitably does. The question thus emerges about the extent to which Hattie's framework of 43 attributes, even with its vast database, can serve to 'plot the complex, variegated landscape that most likely underlies [its] crude averages' (Glass, 2000: para. 27). In other words, can the attributes – as a basis for 'intelligent problem-solving' about teaching and learning – deal effectively with the particularity of the classroom and lead to improved practice that enhances a range of valued outcomes for individual students (Biesta, 2007: 16)?

This issue was addressed using a qualitative process of interpretation that explored teaching and learning on the second year of an HE teacher training programme, taught within FE, that had been re-structured using Hattie's framework.

Research Questions and Design

The research was organised around four questions:

- How does the framework, as a basis for evaluating teaching and learning, impact programme design?
- What practical issues arise when making design decisions around the framework?
- How are the design changes, which emerge through the evaluation of teaching and learning using the framework, enacted when delivering the programme?
- What is the impact on student outcomes in terms of (a) their knowledge of theory, pedagogy and curriculum, (b) their ability to select from a range of pedagogical strategies to plan and deliver effective teaching and (c) their attitude toward teaching and learning?
- To what extent does the framework speak to the particular conditions of the FE context to facilitate a greater understanding of the factors that contribute to successful teaching and learning?

A two stage case study approach was used to examine these questions. This paper describes the results from stage one, which addressed the first question.

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Although often associated with qualitative evidence and ethnographic methods, the case study does not require a particular form of data collection or presuppose a particular research method (Yin, 1981). Instead, it is best conceived as a research strategy that is distinguishable by its focus on the phenomenon of interest 'in its real-life context' (ibid: 59). In this sense, case study research draws from a constructivist paradigm whereby meaning is situated in the events and relations of daily life and its constitutive socio-cultural systems (Yin, 1981; Hodkinson & Hodkinson, 2001). Stake (1995: xi) defines the case study as 'the study of the particularity and complexity of a single case'. The case could be an individual, programme or organisation – it is any bounded system (ibid). In this study, the phenomena of interest – Hattie's framework of effective teaching – was investigated within the context of an HE teacher training programme, and more specifically the second year of the programme which formed a bounded case.

The investigation informing the first stage of the study involved a form of Qualitative Content Analysis (QCA) (Bryman, 2008). This approach was considered appropriate given its focus on: (a) emphasising the role of the researcher in the construction of meaning; (b) letting meaning emerge from key documents; and (c) understanding meaning in context (ibid). To structure analysis around QCA is to engage in a reflexive and iterative cycle of interpretation that is open to working through all possible understandings when documents are brought into contact with different features of context (Altheide, 1987). What matters is not to find the correct and/or complete answer but to '[attend to] the thinking that emerges, and to respond to those insights with more questions, more reading, more wondering and an offering of interpretation to enable others to join the listening and learning' (Smythe, *et al.*, 2008: 1395).

Procedure

The cycle of interpretation began with a review of Hattie's (2009a) *Visible Learning* to develop an understanding of the aspects of schooling that have the greatest impact on learning. *Visible Learning for Teachers* (Hattie, 2012) was then carefully examined. Here Hattie draws upon a range of additional studies, many of which are qualitative or mixed method, to explain the 43 attributes of effective practice. Where possible, these documents were located to explore key messages and clarify terminology. To enhance the transferability of the findings to other contexts, the analysis was informed by the Estyn Common Inspection Framework (2010) and Lifelong Learning UK's (LLUK) (2009) Overarching Professional Standards.

In working with the evidence, summary notes were developed that captured the essence of each attribute. These notes were used as the basis for

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developing key indicators of the pedagogical interventions needed to enact the attributes in the classroom. The initial cycle of reading and analysis was undertaken independently. Findings were then compared and common interpretations agreed upon. A third researcher, who was also a lecturer on the programme, then read through the evidence, which provoked further deliberation. This process of triangulation was used to determine if the proposed indicators were an accurate representation of the attributes and were feasible to implement given available time, resources and expertise.

Participants

The 35 students participating in the study were completing the second year of a part-time teacher training programme for the post-compulsory sector, which was franchised from a Higher Education Institute (HEI). Students were working toward either a professional graduate certificate in education (Level 4 and 6) or a certificate in education (Level 4 and 5), depending on whether they had a degree at entry.

Educational experience was varied. Some students joined the programme directly after completing a course of study whilst others were returning to education after 10-15 years in professional employment. The highest qualification obtained was a Master's degree, and six students had a highest qualification at Level 3.

Results and Discussion

Below is a summary of the findings from the first stage of the study, which considered the implications of Hattie's framework of attributes for teaching and learning.

Implications for teaching and learning

The conception of effective teaching that emerged through the interpretation of the framework is fundamentally about **collecting data on student learning** to know the **impact** we have on students. It is then about using that data to inform:

- (a) the provision of **feedback** that takes students forward in their learning and development;
- (b) **teacher evaluations** of their effects on students – that lead to adaptations, modifications and innovations within the learning environment, which emerge from a **sound understanding of those strategies and conditions that best facilitate learning.**

The attributes of effective teaching that we identified as important for the improvement of student learning speak to these key purposes.

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Collecting Data on Student Learning

Hattie (2012: 62) states that programme planning and delivery should be based upon a 'deep understanding' of learning, specifically in terms of what each student should know and be able to do as a result of teaching. Discussions amongst colleagues and with students can then be informed by this data and interventions jointly developed to help students progress to higher levels of thinking and performance.

We identified two key points where the notion of using data to provide a deep understanding of individual student's knowledge and practice will impact programme provision.

First, during key transitions:

Planned opportunities will be created for first and second year lecturers to discuss each student's progress as they move to the second year of the programme. These discussions will involve a transitional review in the following core areas:

- Teaching Practice
- Key Knowledge and Understanding
- Literacy Skills

The data used to inform these discussions will largely be summative, emerging from portfolios of work completed by each student at the end of year 1. These files contain substantive pieces of writing including research projects and reflective journals, as well as action plans and evaluations of teaching practice. Based on evaluations of each student's performance, clear targets relating to core course components will be developed. There will be a particular focus on identifying those students who are 'at risk' so that early and targeted interventions can be developed.

Second, during the course:

Formative assessment takes place throughout the second year of the programme and includes quarterly reviews of each student's teaching practice; self, peer and tutor assessments; and a variety of formative activities during taught sessions.

We have recognised, however, that systematic formative assessment data is not collected and communicated to individual students on the theoretical, curricular and pedagogical knowledge that emerges during teaching. To address this issue we plan to develop stronger formative assessment activities, including on-line formative questions as well as more structured in-class questioning (using electronic voting systems). Students will be encouraged to self-regulate by analysing their performance; identifying areas for improvement; and setting appropriately challenging goals (which will be

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reviewed during individual tutorials through a review of each student's personal development plan).

Reconsidering Learning Outcomes

Hattie's framework prompted us to consider the quality of outcomes delivered through the programme, both in terms of the nature of learning and the development of meta-cognitive skills.

The Nature of Student Learning

Student learning can be divided into at least 3 levels (Hattie, 2012: 47):

1. **Surface:** accepting new information uncritically and storing it in isolation without making connections to existing knowledge,
2. **Deep:** examining new information critically and integrating it into existing cognitive structures,
3. **Conceptual:** building conceptual understanding of new information and using it to inform future learning.

Hattie argues that successful learning involves a balance of surface knowledge and deep processing, which together enable the construction of conceptual understanding. This balance should be achieved during lesson planning and communicated to students through learning intentions and success criteria. Biggs' SOLO taxonomy (Structure of Observed Learning Outcomes) is identified as a powerful way to structure learning intentions in order to reflect the different levels of learning. Table 1. illustrates how the taxonomy was used to restructure the learning intentions and success criteria for a lesson on feedback.

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Table 1. Using the SOLO Taxonomy to Structure Learning Intentions and Success Criteria.

Learning	SOLO	Learning Intentions	Success Criteria
Deep Learning	Extended abstract <i>(applying ideas to other situations)</i>	Evaluate how you use feedback in your own sessions and consider any changes you could make to enhance its effectiveness	I can critically evaluate my practice and identify 3 ways to enhance the effectiveness of my feedback
	Relational <i>(integrating ideas)</i>	Apply the three forms of feedback to mark a piece of student work	I can demonstrate an understanding of the 3 forms of feedback by using them to mark a piece of work
Surface Learning	Multi-structural <i>(many unrelated ideas)</i>	Describe the characteristics of effective feedback	I can name 3 or more characteristics of effective feedback
	Uni-structural <i>(1-3 unrelated ideas)</i>	Recognise how feedback impacts learning (positively, negatively, not at all)	I can recognise 3 or more ways that feedback may impact learning

A full audit of schemes of work and session plans will be undertaken to ensure that a balance of learning is not only reflected in each lesson's intentions but also through questioning and assessment tasks.

Developing Meta-cognitive Skills

Meta-cognitive strategies have the potential to exert a significant impact on achievement by developing students' ability to regulate their own learning (Hattie, 2012). Hattie reviews evidence assessing the impact of a range of strategies and concludes that those with the greatest impact involve active learning and a high level of engagement with content. A review of each strategy is beyond the scope of this paper; however, those that we considered particularly relevant to students on the programme are summarised in Table 2.

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Table 2. Meta-cognitive Strategies and their Effect Sizes. Adapted from (Lavery, 2008 cited in Hattie 2012:104).

Strategy	Definition	Effect size
Organising and transforming	Rearranging instructional materials, e.g. making outlines before writing papers	0.85
Self-evaluation	Reflecting on performance in relation to previously set goals	0.62
Keeping records	Recording information related to study tasks	0.59
Goal-setting /planning	Setting educational goals and planning activities related to completing the goals	0.49

Although opportunities to support the development of these strategies currently occur during taught sessions by responding to students' needs and creating active learning tasks, the teaching of specific meta-cognitive strategies has not been explicitly targeted. We recognise that this approach offers considerable potential to better accommodate the diverse backgrounds and experiences of our students. The following three metacognitive strategies will be targeted to enhance students' ability to regulate their own learning and engage more effectively with the demands of an HE course:

- 1. Organising and Transforming.** Before enrolling on the programme, many students have not written formal academic essays. Although detailed essay outlines are provided and reviewed in class, additional support will be given to develop students' skills in locating articles, paraphrasing information, structuring a report, etc.
- 2. Keeping Records.** At the start of Year 2, students are given verbal, written and online instructions that describe how to organise and structure their Teaching Practice files. Despite this support, some still struggle. Opportunities for deliberative practice will be incorporated into sessions where tutors model how to organise documents and monitor students as they assemble their own files.
- 3. Goal Setting.** Students who have not completed assigned tasks to deadline during the first year of the programme will be identified. Tutors will work with these students during individual tutorials to develop their ability to set SMART targets and self-monitor and self-evaluate progress.

Providing Feedback

Feedback has the potential to have one of the most powerful influences on student learning, with an effect size twice that of all in-school effects (.79) (Hattie, 2009a). Yet its impact is most variable and depends upon the extent

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to which the right form is provided at, or just above, the level at which the student is working (Hattie, 2012). Hattie develops a model to structure the provision of appropriate feedback that addresses three questions and operates at four levels of learning. The key messages for effectively enacting the model involve: making the intentions and criteria for evaluating learning clear to students so that they understand the goals of their work; using rapid formative assessments (conducted 2-5 times a week) to inform teacher and student judgements about key feedback decisions (i.e. 'should I relearn ... practice again ... move forward ... To what?'); and encouraging self-assessment so that students have opportunities to regulate their own learning (Hattie, 2012: 120). Table 3 illustrates how we envisage this model operating to provide feedback to individual students.

Table 3. Feedback Levels and Questions. Adapted from (Hattie, 2012: 116).

Levels of Feedback	Three Feedback Questions	Providing Appropriate Feedback
1. Task	Where am I going? What are my goals?	Session goals will be communicated through learning intentions and success criteria. <ul style="list-style-type: none"> • Intentions and criteria will be differentiated to ensure appropriate challenge for all students. • Checks will be made to ensure students understand intentions and criteria.
2. Process	How am I going? What progress is being made towards the goal?	Responding to the results of systematic formative assessment data (including self and peer assessment), rapid formative feedback will be provided either through the VLE or face-to-face following in-class formative assessments. Checks will be made to see how feedback is received by students to ensure that it is understood and considered relevant.
3. Self-regulation	Where to next? What activities need to be undertaken next to make better progress?	A self-regulatory component will be incorporated into formative assessments. <ul style="list-style-type: none"> • In light of learning intentions and criteria, students will assess their own progress in meeting goals and personal targets.
4. Self-Level		Efforts will be made to avoid mixing praise with feedback as this reduces the effect.

Evaluating Student Performance

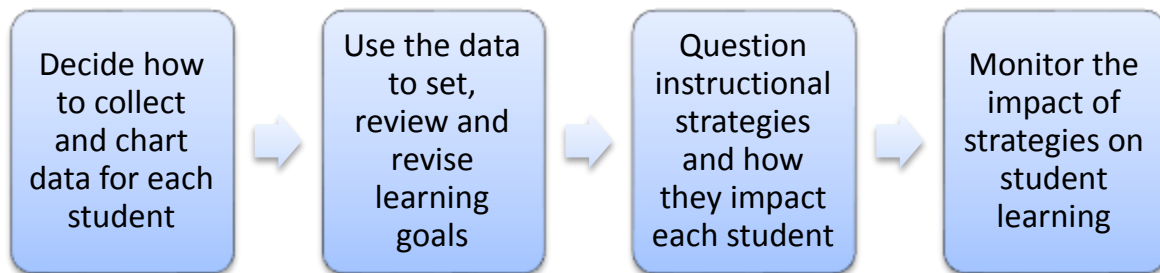
Hattie (2012: 149) argues that discussions about student progress are 'at the core of effective teaching and learning'. He identifies the 'data teams' model as the most effective method to structure teacher interactions in ways that lead to improved outcomes (McNulty & Besser, 2011, in Hattie, 2012). In this

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model teachers reach a shared understanding of what constitutes successful learning and create an assessment plan. They then meet every 2-3 weeks to analyse assessment data (see Table 4). Common insights can then be used to inform a collaborative critique of instructional strategies and the reasons for differential rates of progression.

Table 4. Data Team Model - 4 Step Process. Adapted from (McNulty & Besser, 2011 cited in Hattie, 2012: 60-61).



We currently conduct many progress-related discussions during course and moderation meetings, as well as via informal conversations. However, we recognise that these interactions could be more systematic and robust. We also acknowledge the need to agree upon the knowledge and skills students should demonstrate at different stages in the programme, rather than assuming a shared understanding. This information can then be discussed at monthly data-team meetings, during which a range of evidence about student learning will be reviewed.

Facilitating student learning: strategies and conditions

Many teaching strategies are identified in Hattie's framework that have proven effective in facilitating learning. These signal the need for an audit of existing schemes of work and session plans to evaluate the extent to which the strategies are evident and to determine if new and/or revised strategies would enhance the quality of teaching and learning.

Table 5. (over leaf) provides an example of the auditing process using four strategies that were considered particularly relevant to the programme. Critical questions were identified relating to each strategy that reviewed aspects of programme structure, lesson organisation and content.

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Table 5. Effective Teaching Strategies

Teaching Strategy	Auditing Questions
Strategy 1: Classrooms are dominated more by dialogue than by monologue about learning	<ul style="list-style-type: none"> • Do the questions asked during sessions facilitate dialogue that targets deep thinking? • What is the ratio of teacher-student talk during sessions? • Do group tasks facilitate productive learning or busy work?
Strategy 2: There is a balance between teachers talking, listening, and doing; there is a similar balance between students talking, listening, and doing	<ul style="list-style-type: none"> • To what extent is there a balance of the following three modes of teaching and learning across a scheme of work? <ol style="list-style-type: none"> 1. Didactic classes 2. Coaching labs (students are given opportunities to practice skills introduced in didactic classes) 3. Seminars (Socratic questioning is used to encourage students to question, listen and critique)
Strategy 3: Peers interact positively to facilitate progress	<ul style="list-style-type: none"> • To what extent are opportunities created for cooperative learning and peer tutoring during taught sessions? • Is sufficient support and structure provided during peer tutoring activities to maximise their effectiveness?
Strategy 4: Teachers create multiple ways of knowing and multiple ways of interacting, and provide multiple opportunities for practice	<ul style="list-style-type: none"> • Are students provided with multiple ways of seeing new ideas (verbal, visual, multi-media)? • To what extent is there a reliance on the provision of factual information rather than the creation of opportunities for students to interact with the ideas by rephrasing, integrating or synthesising information as well as problem solving? • Are sufficient opportunities provided for students to deliberately practice skills in class, with appropriate feedback and support, before they are asked to apply these skills independently?

Practical issues

The main practical issue that arose during the design stage of the investigation involved managing a complex process of change. Many of the modifications that emerged as important for improving teaching and learning built upon systems and procedures already in place. Other changes, however, signalled the need for a more substantive restructuring of the programme and the development of additional expertise. When deciding upon the nature and scope of change, it was important to identify practices that would be the most effective for our students while responding to practical considerations, given limited time and resources. This often delicate balance can be seen through our efforts to understand the attribute: 'The climate of the classroom, evaluated from the students' perspective, is seen as fair' and

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determine its pedagogical implications. Key indicators of this attribute included:

- Fostering a sense that students are part of a team working toward shared learning gains;
- Creating a climate that is caring, respectful and fair, with a degree of control and a sense of safety to learn;
- Identifying and addressing problems before they escalate to the level where the flow of learning is disrupted.

As we considered these indicators, we critiqued the strategies used to foster an inclusive atmosphere. We reflected upon group cohesion over past years and sought feedback from current students. We were also increasingly mindful that our notions of climate extended beyond the classroom to the 'community of practitioners' we sought to create, namely a group of students who shared resources and tools and worked together to discuss issues and solve problems (Wenger, 2006).

Through this process of thinking and questioning, we recognised a tension between the support students felt they needed and the greater independence we sought to foster during the second year of the programme. What we as tutors perceived to be opportunities for self-redirection and self-regulation, some students considered 'undirected' and 'unregulated'. A key issue was the greater support students wanted throughout the programme to manage course requirements. The introductory lecture to review key documents was not sufficient – some students felt overwhelmed. The utility of online guidelines, forms and resources was reduced because students found the college's VLE difficult to navigate. Efforts to maintain on-going communication through the VLE's email system also met with varying success – some students did not use their college emails whilst others did not open group emails considering the content largely irrelevant. Together these factors created a disconnect that permeated into the community of learners and impacted our relationships with students and their perceptions and experiences of the programme.

Using this information we again engaged in a reflexive process of thinking, questioning, discussing and reading. We reconsidered our perceptions of the balance between supporting and 'spoon-feeding'. We investigated the experiences and practices of colleagues and researched a range of alternative types of support. We also listened to the innovative approaches our students were using with their own learners to create a sense of belonging and demonstrate authentic care.

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What emerged through this process was an awareness of the need to create support in ways that were meaningful to students to move them towards positive learning gains and foster a sense of trust, care and fairness. Key strategies included:

1. Adopting an alternative form of social media (Facebook) to enable on-going support in a medium familiar to students with collaborative possibilities (Fogg Phillips, Baird, & Fogg, n.d.).
2. Communicating via text messaging, rather than email, using the college's txt-tools programme.
3. Developing a blended learning approach, initially through the use of Podcasts to demonstrate skills in areas where students have repeatedly struggled.

Change is risky. We plan to move from an online system of support that worked imperfectly to one that may not work at all. We recognise the need to engage in on-going efforts to monitor students' use of social media so that issues can be resolved quickly before they disrupt learning.

This example illustrates the complexity that underpins Hattie's approach. The indicators are not a list of instructional strategies that if implemented correctly enhance effectiveness. Rather, they are a set of guidelines designed to facilitate questions about important aspects of teaching and learning.

Conclusion

In this study we have described the process involved in using Hattie's attributes of effective teaching as a basis for evaluating the impact of our teaching. We have articulated an interpretive cycle of inquiry that remained grounded in the evidence by engaging with key texts, while at the same time repeatedly bringing the attributes into contact with the everyday reality of the programme through on-going deliberation and dialogue.

Our experience suggests that Hattie's work makes an important contribution to understanding the practice of successful teaching. As he intended, the conception of effectiveness that emerged from our evaluation became meaningful through a consideration of context and was a function of the extent to which we were willing to interrogate existing practices and confront established beliefs and values. In this sense, the attributes did not reduce 'effectiveness' to a prescriptive list that told us what to do to be effective irrespective of the particular features of our setting and regardless of our judgments but, rather, served as the basis for Dewey's (1929) 'intelligent problem-solving'.

Citation:

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With these benefits in mind, Hattie's work serves as a valuable resource for teacher training on at least two levels. First, as teacher educators it is important that what we teach is informed by an understanding of those practices that have a meaningful impact on student learning. Trainee teachers should be introduced to this evidence but alongside ensuring that they are informed consumers – able to judge the quality of the research and interpret the findings (Drill, Miller, & Behrstock-Sherratt, 2012). Second, it is important that how we teach is informed by Hattie's conception of teaching as a process of deliberately evaluating our impact on learning. This not only has the potential to enhance programme effectiveness but will also make an important contribution to trainees' understanding of those practices that create the conditions for successful learning.

We have found that the greatest obstacles to using the attributes as Hattie intended are the comprehensiveness of the evidence-base and the complexity of the indicated changes. Certainly, these difficulties could lead to partial and potentially inaccurate understandings of key attributes and piecemeal evaluations of existing practices. It is also possible that practitioners could plan overly ambitious programmes of change that could become derailed or diluted amidst the demands and difficulties of daily practice. Nevertheless, as Shulman (2004: 504) points out: 'After 30 years of doing such work, I have concluded that classroom teaching ... is perhaps the most complex, most challenging, and most demanding, subtle, nuanced, and frightening activity that our species has ever invented'. Hattie's evidence-base necessarily reflects and responds to these conditions. The effort of engaging with the evidence should, therefore, not detract both educators and policy makers from a careful and considered review of Hattie's work to inform their understanding of what constitutes effective practice.

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Lloyd, C., Trangmar, R. (2012) 'Investigating the Implications of Hattie's (2012) Synthesis of Meta-Analyses for Teaching Higher Education in Further Education' *Team Journal* 4 (3) October [Online]. Available at: <http://bit.ly/YCbBmy> (Accessed 28 October 2012).

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Citation:

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