

Assessment, creativity and learning: A personal perspective

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Abstract

This paper presents a personal view (a view coloured by my cultural environment and upbringing) of young people's education. I look in particular at assessment practices and detail my understanding of the nature of learning, focusing on creativity and the tensions associated with schooling and creative behaviour. Drawing upon and developing my earlier work in the light of further research and experience, I give an overview of assessment practices and approaches to teaching and learning and argue for a learner-centred approach with a focus on practical work and an environment that promotes creative problem-solving across the whole curriculum. A pedagogical strategy is presented that is based on four areas of activity: reacting, researching, responding, and reflecting.

KEYWORDS

assessing creativity, assessment, creativity, learning and creativity, pedagogy

1 | INTRODUCTION

This paper draws upon my writing, research and experiences of the past half century. During that time, I have been actively involved in creative practice and education in a number of roles—as a student, teacher, teacher trainer, senior examiner, school inspector, school governor and, not least, parent. Inevitably, I present a subjective, personal viewpoint that is coloured by my social background and culture, although this is informed by empirical research. Underpinning this account is the notion that creativity involves an internal, cognitive process that sometimes results in the manifestation of creative products—this manifestation can take many forms in many domains, including the arts, mathematics, and sciences. An ongoing issue is assessment of such manifestations and the processes behind them—how we assess, what we assess, and why we assess. In reflecting upon the topics discussed here, there are some fundamental questions that are implicit in the discussion. These include questions such as *how can we assess creative learning?* and, more tacitly, *what are schools for?* and *what is the purpose of education?*

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2 | ASSESSMENT—AN OVERVIEW

I have written at length about assessment practices in education (e.g., Hickman, 2007; Hickman, 2015) and feel it is necessary to re-iterate some of the definitions that I have made use of in order to clarify my argument; so I present here a paraphrased version with regard to types of assessment. To some extent, the status of individual subjects in schools can be related to how accountable they are; accountability can be linked to measurement, and the assessment of students is intrinsic to this. In particular, examinations that have a worldwide reputation can give great credibility. Formal examinations are, by their very nature, summative, focusing on final outcomes; this can be contrasted with formative assessment which focuses on the learning process, providing feedback to the learner. Hargreaves (2005) notes that formative assessments can play an integral part in students' learning. Another form of assessment, distinct from both formative and summative approaches, is developmental (or 'ipsative') assessment. This approach is concerned with individuals' development from one point in time to another, comparing students' current achievements with past performance and is primarily concerned with their ongoing educational growth. Developmental assessment approaches are characterised by being learner-centred rather than teacher or subject-centred and often take the form of dialog and negotiation between the teacher and the learner. In this way, developmental assessment promotes active involvement and ownership of the learning process. For a comprehensive definition of words such as 'Summative', 'Formative', 'Developmental' and other educational terms, see Hickman (2023).

We might ask ourselves 'Why assess students?'; the general answer to this question is that it provides information. The type of information acquired hinges on the characteristics of the assessment process, as is the value ascribed to it; the needs of the diverse interested parties will determine both the nature of the assessment and its value. Among these parties, I would propose that students harbour the most significant interest. It is imperative for them to discern their strengths and weaknesses, along with understanding the necessary steps for enhancing their practical skills, technical understanding, the quality of their ideas, and their ability to research and realise their intentions. Lecturers and teachers on the other hand need to judge the effectiveness of their teaching and use this to inform their planning. Assessment then, in all of its various forms, is said to help make clear teachers' aims and recognise students' achievement in addition to providing feedback to teachers on the effectiveness of their teaching. In this way, it helps to structure teaching and provide criteria to support professional judgements. Assessment practices play a crucial role in guaranteeing the comprehensive coverage of fundamental subject requirements, while simultaneously endorsing a perspective focused on long-term development and the documentation progress. It is also said to promote and support students' learning through, for example, discussions arising from group evaluations that can develop students' critical evaluative skills. It could be said that the most important thing to assess is the extent to which learners have understood existing knowledge and the extent to which they generate new knowledge.

Having defined the various terms surrounding the notion of assessment in education, we can more easily identify some of the problems that are associated with formal assessment. The partiality of formal assessment processes, such as examinations, is perhaps the most important negative trait. It is axiomatic that students are unique individuals with varying talents and skills; a truly individualised and learner-centred assessment regime is therefore desirable. Such an approach would result in a fairer and more pertinent evaluation, focusing on the students themselves rather than solely on the produced work, which serves as evidence for judgements regarding progress and growth. However, it is not the nature of assessment that is the problem, it is the value that is given to it. There is, I would suggest, a need to shift our collective perspective on assessment and diminish its elevated status. This adjustment might involve appreciating the freedom to encounter failure and the assurance that personal, idiosyncratic, and convention-challenging aspects will not be evaluated against a distant and impersonal standard of excellence. Nevertheless, over the decades, there appears to be a steady shift in education over the decades, moving away from nurturing and facilitating the development of



young individuals towards a focus on scrutinising the products of their purported learning, with an accompanying emphasis on assessment and grading. Consequently, the type of work students are increasingly expected to produce conforms to the system's preference for assessable work, exacerbating the issue of assessment bias. Moreover, examinations can have the effect of perpetuating orthodoxies, with the potential for examiners to reward 'safe work', and they can also restrict creative freedom by tending to focus only on the end product. The biggest problem however is the fact that examinations have a tendency to determine content rather than the content determining the mode of assessment. This has been described as 'Procrustean' (see for example Hickman, 2015). In an educational context, 'Procrustean' refers to the tendency to organise the curriculum or syllabus in a way that conforms to assessment requirements. The term refers to the son of Poseidon in Greek mythology, Procrustes, who accosted travellers. He had an iron bed on which the travellers slept, but if they were too tall, he cut off their legs, if they were too short, he stretched their bodies. The analogy being of course that subjects in schools are altered in form and content to fit the mode of assessment. The resulting uniformity of approach is not conducive to the evaluation of creative thinking and creative outcomes.

Education is, or should be, concerned with the affective, spiritual and moral dimension to human existence, in addition to the standard 'three Rs', which are traditionally 'reading', '[w]riting' and '[a]rithmetic'. It should be noted that an alternative view was put by Professor Bruce Archer: reading and writing, reckoning and figuring, and importantly, wroughting and wrighting, that is, making (Archer, 1979). Just as the lecture (or 'chalk and talk') approach is probably one of the least effective ways of conveying information—but it is simple, direct, and importantly, economical—formal examinations are probably one of the least effective ways of finding out what students really know—but formal examinations are simple, direct, and of course, economical. If we are to truly value education, more resources need to be put into the whole endeavour in order to facilitate personalised learning and assessment of such learning. In an age when students rightly demand their money's worth, the least we can do is serve their needs as individuals. In short, meaningful learning should not be pre-specified. The cliché 'you don't make a pig heavier by weighing it' has rarely been more relevant than with regard to contemporary approaches to evaluating students' learning.

I have argued elsewhere (Hickman, 2015) that the objectives model of teaching and learning is, for the most part, inadequate and inappropriate, especially with regard to heuristic learning, that is, the kind of learning by discovery or trial and error that typifies creative practice. In both schooling and in higher education, league tables and measurement of student performance continue to dominate the educational agenda.

McKernan (2010) notes that the objectives model for educational planning, where learning outcomes are pre-specified, has been the dominant approach in many if not most educational systems, but it is not without its detractors. Finney (2002), for example, argues that it is inappropriate to decide in advance that which is to be learnt, as learning needs to '*embrace the mysterious creative personality of the learner in making sense of feelings, attitudes, values and dispositions*' (p. 9). However, objectives-based planning remains the preferred approach in educational institutions as it is seen to be an efficient way of identifying and assessing educational goals. However, 'efficiency' is not always the best criterion for evaluating worth, as noted by Elliot Eisner:

Efficiency is largely a virtue for the tasks we don't like to do; few of us like to eat a great meal efficiently or to participate in a wonderful conversation efficiently, or indeed to make love efficiently. What we enjoy the most we linger over. A school system designed with an overriding commitment to efficiency may produce outcomes that have little enduring quality.

(Eisner, 2002, p. xiii)

Enduring qualities, such as good physical and mental health, are described by Barone (2001), who also highlights how educators can learn from their students. It is only in a learning environment

characterised by mutual respect, where individuals are valued, that meaningful two-way learning can occur.

It is worth reminding ourselves of ‘desirable goals’ for education, as any assessment procedure should be directed by the desired outcomes. General aims for education can be grouped into broad areas of social utility and personal growth. Among these, personal growth holds the utmost significance to the individual, especially when viewed from a learner-centred perspective that prioritises the individual student. Planning for individualised learning means also planning for differentiated learning. The problem here is that most of the approaches used in teaching at all levels still adhere to an industrial input–output approach to teaching and learning. Achieving truly differentiated learning is a complex task, but it is facilitated by being based upon an approach that underscores the creation of an environment where learning can *emerge* according to individuals’ strengths and aptitudes.

The formal end of the course examination system treats students as if they were all the same; it can promote an unhealthy attitude towards learning and knowledge acquisition, fostering a negative competitiveness which in turn can encourage cheating. What is known as ‘authentic’ assessment focuses upon higher order skills which have become even more necessary in a world of AI and instant access to knowledge. These skills include critical thinking, collaboration, and creative problem-solving which can be related to the needs of society, commerce and industry—such skills would in all probability be more effectively evaluated through dialog and portfolio review.

The things that are usually meaningful to a student include gaining a sense of achievement and developing a sense of identity. Meaningful assessment to me means assessment that actually assesses what a person can know, understand, and is able to do, not what they do not know, understand or cannot do. It takes into account tacit understanding—we all know more than we can tell. Assessment should be characterised by being developmental, that is, focusing upon individuals’ personal progress, comparing present performance with past achievements. To effectively implement this approach, it should also be portfolio-based and take the form of a *negotiated dialog between the teacher and the student*. The lecturer, teacher or examiner, who would probably be in a position of authority (derived in part from an in-depth knowledge of the subject) can bring to bear her or his connoisseurship as part of such a dialog.

Connoisseurship is a concept often associated with Professor Eisner (see for example Eisner, 2003). An early mentor of mine, the late Professor Brian Allison, referred to it disparagingly, in conversation with me as ‘Whippet Fancying’. Whippets are small greyhound-like dogs used for racing, especially in the north of England. Judging whippets’ racing prowess ability is a skill acquired through practice, to notice barely discernible features, such as a determined gaze; the whippet fancier can then make an informed prediction as to the outcome of a race and bet accordingly. The reference to ‘whippet fancying’ in the present context refers to the notion of connoisseurship; teachers and lecturers, who possess the most intimate knowledge of their students’ abilities, play the part of the connoisseur. The connoisseur then, is someone who has studied something, perhaps informally, and has gained an intimate understanding of all its attributes. Being a connoisseur primarily arises from accumulated experience, enhanced perception and the ability to discern subtleties that might otherwise go unnoticed. The subtleties of creative thinking and its products can be difficult to quantify, suggesting a need for developing skills of connoisseurship. Lewis (2005), for example, asserts that in order to examine student achievement, teachers must consider developing ‘connoisseurship, appreciation, or creative insight’ (p. 1). Before examining how this might be achieved, I feel it is necessary to give a brief overview of the nature of creativity.

3 | CREATIVITY—AN OVERVIEW

Firstly, in the time-honoured fashion, a few definitions: this first definition, taken from what is known as the NACCE Report is one that I have found to be the most useful and succinct:



Imaginative activity fashioned so as to produce outcomes that are both original and of value

(NACCE Report–DFEE, 1999, p.29)

Other definitions follow a similar line, such as this from Rob Pope:

the capacity to make, do or become something fresh and valuable with respect to others as well as ourselves

(Pope, 2005, p. xvi).

While creative thinking in the 2022 PISA Test is defined as

... the competence to engage productively in the generation, evaluation and improvement of ideas, that can result in original and effective solutions, advances in knowledge and impactful expressions of imagination

(OECD Directorate for Education and Skills, 2019)

What is clear from each of these definitions is the importance of not just originality but also of value, especially with regard to addressing problems and formulating effective and impactful solutions to such problems. This clearly has to be the case for what we can term ‘big C creativity’—creativity that is genuinely ground-breaking in terms of human knowledge and understanding. However, in education, we are usually more concerned with ‘little c creativity’ (Craft, 2001) where original can mean original to the learner, while value can be determined not just by evaluating practical utility but by looking at overall quality and worth to the learner (see also Ching et al., 2023).

Schooling is generally a normative enterprise—inducting young people into the norms and expectations of wider society. While some aspects of creative behaviour can challenge this, there are other aspects that align closely with what is often seen as desirable behaviour. The behaviours that can be seen as challenging include an ability to concentrate and persist, great curiosity and the courage to pursue ideas in the face of opposition. In addition, playfulness with ideas, materials or processes and a willingness to explore unlikely connections can often be construed as disruptive behaviour. Coupled with a confidence to take intellectual and intuitive risks, creative behaviour is not often welcome in the typical school classroom. On the other hand, the ability to work as part of a team and to communicate effectively are creative traits that would normally be appreciated in schools. More importantly, and this is where many teaching and assessment practices are challenged, is the aptitude to accept failure as part of the creative process.

For meaningful innovation to happen, we need the right environment. My own research (e.g., Hickman, 2013) amongst creative practitioners in educational institutions has revealed a clear antipathy towards the typical school environment. This is one respondent's declaration:

Why would anyone want to work in a school? At the time it seemed a job where all your creativity would be squashed and you would have to follow too many rules.

A concern for individuality was often reported amongst the creative respondents; there was an associated, often negative, reaction to authority, together with a feeling of ‘being different’.

Perhaps, the most influential work regarding the assessment of creativity is that created by Ellis Paul Torrance: the Torrance Tests of Creative Thinking (Torrance, 1972, 1984). The tests originally involved a simple measurement of what has been termed ‘divergent thinking’, which were scored on four scales:

- Fluency: The total number of interpretable, meaningful, and relevant ideas generated in response to the stimulus, that is, the ability to generate quantities of ideas.

- Flexibility: The ability to create different categories of ideas and to perceive an idea from different points of view.
- Originality: The ability to generate new, different and unique ideas that others are not likely to generate; the statistical rarity of the responses.
- Elaboration: The ability to expand on an idea by embellishing it with details or the ability to create an intricate plan.

Later editions of the Torrance tests eliminated the Flexibility scale adding ‘Resistance to Premature Closure’ and ‘Abstractness of Titles’ as two new areas. With the five norm-referenced measures that he now had, other measures were added which include expressiveness of titles, syntheses of incomplete figures, unusual visualisation, extending or breaking boundaries, humour and richness of imagery, these and other measures were criterion-referenced. Torrance pointed out that the initial four components of creative thinking operate synergistically, seldom manifesting as isolated cognitive processes. However, any of the four could dominate during creative thought. To indicate the flavour of the Torrance tests, some examples of activities associated with the original four elements are as follows:

This activity emphasises fluency:

Name everything you can think of that is, or is associated with the colour red.

This activity emphasises flexibility:

Name all the things you can think of that have wheels that are not vehicles.

This activity emphasises originality:

Make up strange punishments for contravening strange rules.

This activity emphasises elaboration:

Describe the customs and practices of intelligent life on another planet.

These examples give an indication of the kind of attributes that are often looked at when attempting to assess creativity. The Torrance test remains very popular and are still widely used; they have however come under increasing scrutiny. Some commentators (e.g., Baer, 2011) have drawn attention to their limitations, in particular, equating creativity with ‘wackiness’ or eccentricity. Beyer draws attention to the notion that the Torrance Tests simply measure divergent thinking ability and only in certain narrow domains but, despite this, they are often used to indicate more general creative ability, with the ‘value’ dimension often overlooked in favour of novelty.

Researchers at the *Centre for Real World Learning* at Winchester University have developed a model based on five ‘creative habits of mind’ (Claxton et al., 2013). These habits are said to be collaborative, disciplined, inquisitive, persistent, and imaginative. They are described as follows:

COLLABORATIVE: co-operating appropriately; giving and receiving feedback; sharing the product;

DISCIPLINED: developing techniques; reflecting critically; crafting and improving;

INQUISITIVE: wondering and questioning; exploring and investigating; challenging assumptions;

PERSISTENT: sticking with difficulty; daring to be different; tolerating uncertainty;

IMAGINATIVE: playing with possibilities; making connections; using intuition.

Using these five habits of mind, the team developed an assessment tool that was found to be useful in the form of an ‘assessment wheel’ for student self-assessment. The ‘wheel’ is divided into the ‘five habits of mind’ with four divisions representing levels of competence. Each segment is shaded according to self-evaluation, moving from the centre to the outer perimeter, starting with ‘Beginning’ and moving through ‘Developing’ and ‘Confident’ to ‘Expert’. This approach to assessment has proved to be valuable in terms of identifying areas where learners can develop their creative potential. It was piloted successfully in a London school and continues to be used and developed. Of particular value is its focus on assessment *for* learning rather than assessment *of* learning and that it provides a framework for students to reflect upon their own creative thinking.



4 | TEACHING & LEARNING—AN OVERVIEW

Just to remind ourselves about some basic notions regarding how we learn, and consequently how this informs our teaching, I give here an overview of concept acquisition and basic ideas about cognitive development. Concepts can be simple and concrete, such as ‘rock’ or ‘red’, or they might be complex and abstract, such as ‘Dada’ or ‘axiology’. Concepts are acquired more effectively through the use of supporting material (such as images to complement words). A concept is said to have been comprehensively acquired when the learner is able to use the concept in a context other than the context in which it was learnt. In education, the metaphor of scaffolding is often used—it refers to the supportive strategies put in place and then incrementally removed when they are no longer needed. Scaffolding encompasses a range of instructional methods designed to guide students gradually towards deeper understanding and increased autonomy. Effective teachers can offer successive tiers of temporary support, assisting students in attaining elevated levels of comprehension and skill acquisition that would be challenging to achieve independently.

It is important to build upon what learners already know and understand; concepts are taught more effectively by building upon learners' existing conceptual framework. This can be related to what is commonly known as the ‘zone of proximal development’ (or ‘ZPD’). The ZPD is a concept originally formulated by Lev Vygotsky. The learning ‘zone’ is where a student can perform optimally, employing the assistance of someone more knowledgeable, such as a teacher or parent. Developed in the early 1930s, Lev Vygotsky's work is based on the idea that individuals construct knowledge and understanding from their experiences, maintaining that learning occurs through purposeful and meaningful social interactions.

When a learning task is given without appropriate scaffolding, learners are likely to get frustrated and give up. When a learning task is given that is too easily accomplished, learners can get bored and are likely to engage in activities other than those desired by the teacher. In addition, teaching and learning generally involve maintaining a balance between what is known as ‘procedural knowledge’ and ‘declarative knowledge: ‘knowing how’ and knowing that’. For example, ‘knowing how’ to change a fuse in an appliance and ‘knowing that’ the fuse helps protect the appliance.

In considering the nature of teaching and learning, it is useful to refer to theories of cognitive development, with the pioneering work of Swiss psychologist Jean Piaget as a starting point. Piaget (1950) presented the theory of constructivism, asserting that knowledge is not simply transmitted from teacher to student but actively constructed in the mind of the learner (see Huitt, W., & Hummel, J., 2003). Constructivist theorists (see for example Wang et al., 2023) assert that learners create ideas from their own base of knowledge rather than simply receiving them; constructivist approaches to learning are said to foster critical thinking and create motivated, independent learners. Constructivism highlights the interests and abilities of children to achieve specific educational goals at different ages. It is often divided into two aspects: Social Constructivism (based on the work of Vygotsky) and Cognitive Constructivism (based on the work of Piaget).

Vygotsky's ideas differ from Piaget's in other important ways: in the first place, Vygotsky's theory strongly emphasises the role of culture, while Piaget viewed it as being universal. Secondly, related to this, social factors, such as parents and schooling, play a significant role in Vygotsky's view of cognitive development. A further distinction between the two psychologists' views on cognition and cognitive development is the role and nature of language. Vygotsky saw thought and language as being initially separate, while Piaget saw thought as a phenomenon distinct from and preceding language.

It seems evident that there is a universal element to cognitive development, tempered to a greater or lesser degree by social and cultural factors; I have not seen any research that contradicts this. We can infer that it is not appropriate to expect most children to deal with abstract concepts before about 11 years of age, that is, before what Piaget termed the ‘formal operation stage’. It seems evident that people being taught in groups based on their age (at a particular time of year) rather than their developmental stage or interests is probably not conducive to meaningful learning.

Language in general is a conduit for concepts; concepts are reified through words. In this way, the internal processes that constitute creative thought become externalised and concrete, sometimes in the form of creative products (such as a novel mathematical equation or an engineering design solution). A strategy presented here is based on four areas of activity: reacting, researching, responding and reflecting. These areas can inform a curricular framework within which students can operate in a structured way; it is also a pedagogical strategy. Characteristics of these four areas are

REACT—an initial affective response to teacher input;

RESEARCH—a period of systematic inquiry, both assisted and independent;

RESPOND—a considered response based on what has been discovered through systematic inquiry;

REFLECT—an opportunity to think over and contemplate the meaning and nature of the teacher input, in light of the research, and an internalising of the information found from systematic inquiry.

This framework was first presented in Hickman and Heaton (2015) as a spiral model for learning; this can be seen in Figure 1.

The model shows the relationships between students' private understandings and public discourse. The insertion of 'reflect' after the 'research' component, in addition to its position after 'respond', aligns with the fundamental concept that learning is an ongoing process, and introspection, whether conscious or not, about past learning is intrinsic to it. The widening of the spiral at the top signifies the broader, more intricate understandings that define advanced learning and response.

The theoretical foundation for this concept is rooted in developmental psychology, as conceived by both Vygotsky (1932) and Piaget (1950) in that children's learning evolves from the concrete to the abstract and from the simple to the complex, building upon existing conceptual understandings. The inside of the model can be associated more with private, individual understandings; the move from naïve to sophisticated levels tends to be personal and idiosyncratic but influenced by the public domain. The public domain is associated more with the outside of the spiral band and can refer to the different levels at which concepts are generally understood. This is the domain where shared understandings, spanning various levels, lead to a concern for assessing learners' capabilities. It is

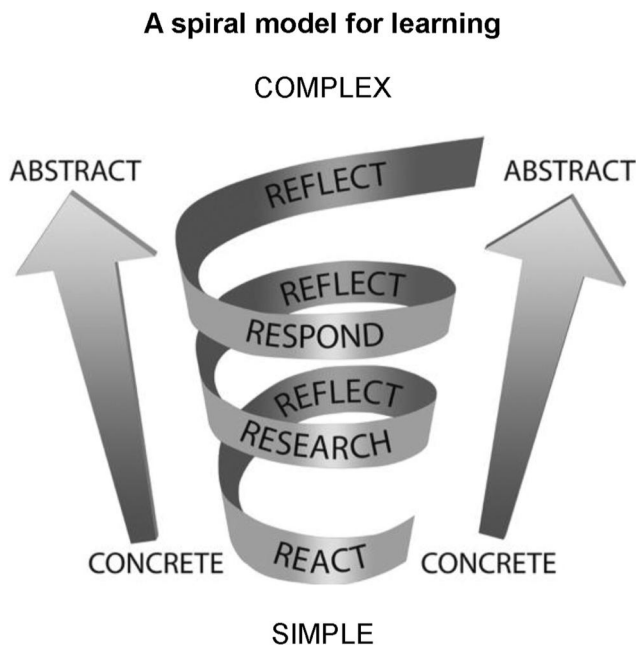


FIGURE 1 A spiral model for learning.



characterised by the communicative aspect of learning, where dialog and discourse are essential elements and where concept labels are tried and tested. This dimension encompasses both informal and formal learning where students are guided (as indicated in Vygotsky's 'zone of proximal development'), and conceptual development is facilitated.

'Reflect', located on the inner band of the spiral, indicates the essentially personal and 'inner' nature of reflective activity. This aspect is particularly important because it highlights the process of internalising information and building upon learners' existing understandings. The learner's conceptual framework is revised and developed, transitioning from the concrete to the abstract. The 'research' component enables investigations tailored to students' abilities, needs, and aptitudes. The model presented here recognizes the legitimacy of students' reactions and responses while offering a framework for both structured teaching and heuristic learning. The 'respond' stage can be compared with the 'react' stage, aiding in monitoring students' learning and assessing the extent of their development, from naive to sophisticated, through social discourse.

It is sometimes said that if one perseveres one can achieve anything. This is patently untrue. Not everyone can run a marathon, irrespective of the amount of training they do; not everyone can fully understand quantum mechanics, regardless of the amount of studying and tuition they undertake. What educational institutions can do is provide opportunities for people to fulfil their potential.

A metaphor that I have used elsewhere (Hickman, 2010) is that of a frog who wants to get to a juicy fly at the top of some steps. The steps are each 10 cm high, but the frog can only jump 9 cm and so never gets above even the first step. In terms of attaining the goal of the juicy fly, the frog needs to do some learning. The frog could do repetitive step-jumping exercises under the guidance of a step-jumping expert in order to gain the ability to jump the extra centimetre. However, it could be that the frog's developmental level is not fully realised—given a few weeks the frog would naturally be able to jump higher and in any case might not be capable of the rigorous exercise routine demanded by the step-jumping expert. On the other hand, it might be that the frog fails to climb the stairs at all and could eventually decide that it is not worth expending the required effort. The frog might intuitively be aware that there could be another juicy fly that does not require leaping up steps in order to catch it and might even realise that a sticky tongue can reach quite a long way; there could be many creative solutions to the fly-catching problem. Learning environments need to offer range of experiences and pedagogic approaches in order to facilitate creative problem-solving.

5 | SUMMARY

Assessment of creativity, I suggest, involves both assessing both the quintessential act of creation, which occurs in the mind, and the reification of that creativity. In order to assess creative cognition, we can only rely on the kind of research tools employed by social scientists to access people's inner life—tools such as questionnaires and interviews. In a school situation, the self-assessment approach, as exemplified by the work of Lucas et al. (2023) seems the most appropriate. Coupled with this, one can assess the physical outcomes of creative cognition as *evidence of learning*. That is to say that it is inappropriate to assess students' creative outputs as one would assess such outputs in the world of commerce and industry; educationalists are, perforce, involved with learning.

Learner-centred approaches to teaching, learning and assessment could be seen as a distinctly 'western' notion, with creative outcomes a minor concern. However, as more occupations are taken over by artificial intelligence, developing creative skills and attributes such as curiosity, imagination, empathy, a willingness to experiment and problem-solving become increasingly important. Effective learning is organic, it emerges from a meaningful interaction between the learner and a more knowledgeable 'other'. It does not do so in a vacuum but is facilitated by building upon existing concepts in a supportive environment with more than one mode of instruction. The ethos, atmosphere and general organisation of many schools is not conducive to creativity, in particular, the kind of assessment practices that currently dominate.

There are though some useful aspects that can be gained from traditional formal assessment in schools. It has value in that it helps provide criteria to support professional judgements and recognises students' achievement. It also provides feedback, apprising the parties involved on each learner's progress, and helps to inform future planning. However, we need to ensure that assessment practices do not determine the content nor the nature of its delivery. If formal tests and examinations are undertaken, we must be alert to the fact that they are partial and only examine the examinable. Moreover, most assessment procedures (and approaches to teaching) as they are currently conceived militate against creative behaviour, particularly privileging summative assessment *of* learning rather than formative assessment *for* learning. We should not be assessing end products (such as art and design objects, results of experiments and pieces of writing) as if they were in the so-called 'real world' of galleries, factories, workshops, and offices but as ongoing examples of what students have learnt.

I have suggested a model for learning based on the notion of beginning with the learner's current level of understanding and their reaction to teacher input and what we might call 'learning material'. Reactions can be built upon, mainly through language, moving from the concrete to the abstract and from the simple to the complex, thereby increasing in difficulty, with time and space for reflection. This model is based on the notion that progression in learning involves understanding gradually more complex and more abstract concepts. To facilitate this, I suggest periods of reflection after guided and independent research on the part of the learner.

It is important that we clarify why a student is being assessed as well as what exactly is being assessed. In addition, how the assessment is to be conducted needs to be carefully considered. Charles Darwin, writing in his memoirs, notes that a lifetime of using his mind as 'a kind of machine for grinding general laws out of large collections of facts' caused him to lose his enjoyment of the arts (Barlow, 1969). In a similar way, we need to be mindful of the possibility of destroying students' enjoyment of the creative process through over-emphasis on assessable products. However, I would suggest that there is no such thing as 'the' (as in the definite article) creative process, as by its very nature, creativity is fluid and unpredictable, but the spiral model provides a loose framework that helps educators to understand 'a' (as in the indefinite article) creative process. Such an understanding enables a more meaningful, learner-centred approach to the assessment of creative activities. The important issue is that crucial dimensions of learning and human development are not easily measurable. Elliot Eisner's epigram before his discussion on the educational uses of assessment and evaluation in 'creative subjects' is relevant here:

Not everything that matters can be measured, and not everything that is measured matters
(Eisner, 2002).

I put the term 'creative subjects' in quotation marks to indicate that although they are designated, thus, the designation is not necessarily accurate. I have witnessed many lessons in the so-called creative subjects that are anything but creative, while I have seen numerous activities in, for example, the sciences that have been creative in delivery and that have facilitated creative responses. The fact is that all subjects can provide creative opportunities for both teachers and students; how we plan and evaluate creativity is not necessarily determined by the subject material but by the learning environment and its structures and systems.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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