Creating creativity

In this age of automation, we're told that creativity is the single most important skill we can pass on to our students. However, arguments about whether – and how – we can teach children to be more creative have raged for decades. Here, researchers **Stellan Ohlsson** and **Pim Pollen** argue that we have been looking at the issue the wrong way. They offer a new way of viewing creativity that they believe may mean it can be more easily taught

"*Why don't polar bears eat penguins, even when they are really hungry?*"

Your mind whirs. "Is it because penguins are too fast? Unlikely. Because penguins don't taste very nice? But the bear is desperate for food..."

"Perhaps," interjects the questioner, "you should try and be more creative."

This seems like odd advice.

"This is a knowledge problem," you reply. "You either know it or you don't."

"Ah," says the questioner, "but what if we are not talking about a creative answer, but a creative way of getting to an answer?"

"I am not a particularly creative person," you reply.

"How do you know?" the questioner responds. "What if that way of getting to an answer is one example of one component of a different way of looking at creativity?

"And what if that different way of looking at creativity ended up being the conduit through which we finally crack the problem of how we train children to be more creative?

"Don't you want to give it a try? Don't you want to see if you think we are right?"

What is creativity? Multiple definitions exist. The one settled upon by us is: the ability to filter through multiple competing concepts, as well as cognitive functions and processes, such as considering ideas in working memory (see Christian Bokhove's column on page 35 for more on this).

In an innovation-driven society, creativity is not only an individual trait that we admire in artists, inventors and other creatives, but also an enabling factor in all aspects of life, including education, government and organisations. Consequently, creativity ranks high on the appreciation ladder for recruiters and employers, and techniques that aim to bolster a person's creative powers are receiving increasing attention.

Despite what some may argue, empirical research confirms that creativity can be trained, but the training effects are often limited in scope and the effects do not always transfer from training to application contexts.

Why might that be? If we look closer at creativity, we come to see that the view of how it works is reliant on the now universally accepted view of cognition as being built on basic cognitive processes. Examples include the processes of encoding and retrieving an item of information from memory, forming a visual image, setting goals, drawing conclusions and comparing alternatives. In very simple terms, the brain as a set of cogs.

If we take creativity as part of this model, then we come to see the creative process as one of a combination of certain cogs. For example, "divergent thinking" refers to a cognitive process that is characterised by four components: originality, flexibility, fluency and elaboration. It requires, at least, retrieval of prior knowledge from long-term memory, the evaluation and prioritisation of alternative actions vis-à-vis a problem and the elaboration of a chosen action.

So if we want to get better at creativity, goes the theory, then we need to make these "cogs" work harder and/or better.

Training for creativity has traditionally tried to do just that and, as mentioned earlier, it has been shown to have statistically significant effects on at least some tests of creativity. Scott, Leritz and Mumford (2004) conducted a meta-analysis of 70 studies of creativity training programmes. They found that the average effect size across studies for divergent thinking scores was .75, a statistically significant and relatively large effect.

But there are some problems. Although training effects can be large in statistical terms, it is not always clear how strong their impact might be in a real-world context. Another issue is the longevity of the observed training effects. And a further issue is the way the creativity tests before and after training are conducted – for example, the more similar the pre- and post-tests are to the training tasks, the weaker the evidence for sustained and generalisable training effects with broad impact on everyday behaviour. Many studies have used pre- and post-tests that are very similar, indeed, even identical.

So the question arises of how the field of creativity training, particularly in schools, can expand its repertoire of training types. Are there other theoretical frameworks that might lead to new types of training programmes? Can we see creativity differently in order to try and better figure out its mechanisms?

We believe there to be one view in particular worth considering.

Many cognitive traits refer to dispositions instead of abilities or processes.

Consider the act of a pupil asking a question. It requires certain processes and abilities, including access to the mental lexicon and the application of grammar rules (it needs the "cogs"). All competent speakers of a language possess those abilities.

But some individuals ask more questions than others. The reason is not that less inquiring individuals lack the ability to ask questions. It is more likely that individuals differ in their inclination to ask questions.

Some individuals are less prone to inquire or to seek more information than others, for example. Or the circumstances that stimulate a person to ask a question might be constrained, causing the cognitive and linguistic processes involved in question-asking to lay dormant even though an opportunity to ask a question has presented itself. It is not that the person is incapable of asking a question; he or she is just not disposed to do so.

It is useful to think of a disposition as having three parts.

● **Relevant behaviours**
In our didactic example above, the behaviour of interest is to ask a question.

● **Triggering conditions**
These are situation features that signal an opportunity to execute the relevant behaviour. Continuing our question-asking example, a person might notice that certain information is lacking in a document or a presentation.

● **Links**
By this, we mean the link between the triggering conditions and the behaviour. We will assume that such links can vary in strength, that the relative strength determines the probability that the relevant behaviour will occur, and that the strength can increase or decrease in response to experience. So in our example, the trigger may well be present, but whether the associated behaviour occurs depends on whether the person recognises that one is linked to the other.

So what happens if we switch our view of creativity from being process-driven to being a disposition?

First we would have to explore which dispositions might be essential for the production of novelty. What are individuals who create more than others disposed to do? What behaviours are they more inclined to engage in than the rest of us?

An empirically grounded answer to these questions would require extensive data collection and analysis of the behaviours of creative and less creative individuals

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in real situations. That work is still in the future. However, historical and biographical accounts of significant creative achievements provide some suggestive clues as to what the relevant dispositions might turn out to be (Gruber, 1974; Isaacsson, 2017; McCulloch, 2015; Wallace and Gruber, 1989).

The dispositions that we suggest are central for creativity fall into three categories: dispositions pertaining to a creative person's executive functioning; dispositions pertaining to the organisation of creative work; and dispositions pertaining to the creative person's social interactions.

1. Executive functions

This would include the disposition to connect seemingly unrelated parts of a problem; to look at a problem from multiple vantage points; and to bracket (that is, mentally set aside) cognitive conflicts and contradictions.

How might these dispositions facilitate discovery and invention? For example, why does it help to switch vantage points, to move back and forth between alternative perspectives?

Consider the question earlier of why polar bears do not eat penguins, even when the bears are starving. The question is likely to suggest an image of a polar bear and a penguin, as they might appear on the pages of a nature magazine. This perspective suggests a search for factors that would interfere with the polar bear's penguin hunt.

If the person considering the question looks at the problem from the vantage point of a satellite in orbit, he or she might create a mental image in which the polar bear is located at the North Pole and the penguin at the South Pole, and the difficulty is immediately overcome. There is nothing in the question itself that indicates that a shift in perspective might help. However, a person who is inclined to shift from the nature magazine perspective to the orbital perspective has a higher probability of hitting on the right explanation: that polar bears and penguins do not interact because they live at the opposite ends of the Earth.

Of course, any adult possesses the cognitive ability to visualise either the magazine view or the orbital view of this question. The probability of finding the explanation is not a matter of mental resources, capacity limitations or the effectiveness of basic cognitive processes, but of being disposed to look at the situation from multiple vantage points.

2. Work organisation

This would include the disposition to sustain a creative project over a long period of time; to start new projects even in the face of an already crowded schedule; and the inclination to develop habits and standardised procedures for non-creative aspects of work.

How does it facilitate innovation to start up new projects even when the person is faced with an already crowded schedule? Only a small proportion of significant creative projects ever come to fruition. The file drawers of authors are brimming with drafts of novels that await a last chapter; the laboratories of academic researchers are littered with the debris from past projects that were never published; the studios of painters contain sketches that were preparatory for some large painting that never saw the light of day; and so on.

Individuals who attempt more will, in the end, achieve more than someone who is disposed to focus on a single project, however high its priority. The disposition to begin new projects capitalises on this fact.

3. Social interaction

This is how the creative person handles his or her social environment. These include the disposition to join a creative collective such as a research group, artistic community or laboratory. Also, creatives tend to attract one or two junior colleagues that fuse the roles of collaborator and friend.

The benefit of being a member of a large, creative collective is not mysterious. The Impressionist school of painting provides an example. By painting together, the Impressionists shared techniques and contacts and gave each other supportive criticism.

A permanent apprentice, meanwhile, can provide invaluable support and input, including helpful criticisms. They can be trusted; they understand the overarching ambitions of the creative person. So the dispositional view of creativity is based on the central idea that there is a set of dispositions that are stronger in creatives than in less creative persons. The grounding of those dispositions in empirical evidence is still in the future. But how might we use this way of thinking about creativity to be able to train pupils to be more creative?

How would a disposition-based training approach work in schools?

Stage 1: Identify the relevant behaviours

The trainee studies creative products from the relevant field of activity (technical products, mathematical proofs, poems, business practices, scientific discoveries, management techniques etc). The goal is to sharpen the trainee's concept of what the creative individuals in that field do when they create. What key moves result in creative products? At this stage, the instruction would follow established principles for direct instruction (Rosenshine, 2012).

Suppose an art teacher would like his or her students to become more inclined to combine and mix different painting styles (eg, Abstraction and Surrealism) in their own paintings. What would Stage 1 of a disposition-centric training sequence to strengthen this disposition look like?

The students would study paintings that combine, incorporate or alter multiple painting styles. The teacher shows how to recognise the separate styles, using fully guided instruction.

After this initial instruction, the students try to paint in the different styles under the guidance of the teacher.

Subsequently, the students would practise painting in the different styles without guidance. A useful exercise might be to copy one painting in two or more different styles.

At the end of Stage 1, the students should have a clear idea of how different painting styles might be combined to achieve particular artistic effects.

Stage 2: Identify potential triggering factors

The trainee tries to identify the triggers for the relevant behaviours. Given examples of situations in which a certain action was contributed to the emergence of a creative product, which features of those situations made the relevant actions useful?

In the art education case, the students would study paintings that exemplify mixtures of style elements from the point of view of understanding why the painter employed mixed styles. The teacher would help the student to identify the features that might trigger the use of mixed styles.

Stage 3: Strengthen the links

The trainee works on multiple problems, situations or scenarios in which a particular behaviour is applicable and useful. The goal is to create and strengthen links between the triggering factors and the appropriate behaviours, so that the triggering factors reliably activate those behaviours.

In the art education example, the goal is for the student to link the triggering features to the act of mixing styles. The student paints several paintings with the goal of achieving a given effect with respect to multiple motifs, where the motifs and the desired effect are selected by the teacher to illustrate and exemplify what was learned in Stages 1 and 2. Repeatedly reacting to the triggering factors by mixing styles would strengthen the links between the triggers and the act of using mixed styles, increasing the probability that the student will use mixed styles in his or her own work.

Stage 4: Fine-tune the relative link strengths

The trainee works on multiple problems, situations or scenarios for which multiple dispositions are relevant. The goal is to adjust the relative strengths of the different dispositions.

In our example, the student works on open-ended exercises. The disposition to mix styles operates in the context of all the dispositions that are relevant for painting. In the long run, the relative strengths of the different dispositions will gradually become adjusted to the demands of the activity. That is, the learner's profile of disposition strengths becomes more like that of recognised creatives in the relevant field of activity.

According to the disposition-centric view, the purpose of creativity training is not to increase the efficiency of basic cognitive processes, enlarge cognitive capacities, nor to develop new cognitive skills. The purpose of training is instead to prompt the trainee to become more disposed to engage in the relevant behaviours.

So, what would training actually look like? We describe a four-stage process in the box above.

Admittedly, at this time, there is no guarantee that a disposition-centric view will lead to training programmes with greater effect, longer duration or more transferable effects than training based on the process-centric view. The data is not yet available.

The reason to nevertheless take an interest in disposition-based training at this time is that the increase in creativity generated by process-oriented training programmes is lower in magnitude, less sustainable and less transferable than one would expect if the underlying theoretical rationale was valid.

And the disposition-centric perspective does not deny the reality of cognitive processes, capacities or abilities as studied in mainstream, process-centric cognitive psychology. We see this as an addition to that way of training creativity, not a replacement for it.

But it does offer a different window through which to view creativity, the potential of which remains under-explored. That window may be uncomfortable for some. It requires us to recognise that there is no – indeed, there can be no – general creativity measure. The power of a particular profile is dependent on the demands of the field of activity. Creativity can only be quantified relative to a field of activity.

Becoming more like a creative person has different meaning depending on the field of activity, so the ideal profile might be different from field to field.

So while this shift may offer us a way of helping pupils to be more creative in set disciplines, it calls into question whether we can ever train someone to be a generally more creative person. ●

That is not to say, of course, that disposition-centric training is perfect. There are three major limitations:

● First, accurate identification of the relevant dispositions might require extended field observations of creatives in their regular habitat – an expensive and resource-demanding type of inquiry.
● Second, it is not to be expected that every individual who undergoes a disposition-based training programme will change to the same degree or in the same way.
● Third, a single exposure to disposition-based training is unlikely to have large or long-term effects, especially if the programme is of short duration. The probability of a significant improvement is greater if an individual participates in recurring training programmes.

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