Developing Creative Teaching Skills in Pre-Service Teachers

Rachel Simpson; Douglas Newton; Lynn Newton
School of Education, Durham University, Durham, England

Abstract

Teaching is an interactive process as teachers respond to diverse interests and needs of learners, alongside the changing demands of education systems. Giving teachers the opportunity to develop competence in creative teaching may enable them to prepare and improvise teaching to maximise learning. A package to foster creative teaching through various learning experiences was constructed and tested on pre-service teachers. The effect of the package on seventy-two pre-service teachers was assessed, largely by quantitative pre and post-tests and qualitative responses. This was supplemented by data from similar teachers who did not have this opportunity. There was strong evidence of worthwhile increases in the pre-service teachers' understandings and use of creative teaching approaches following their completion of the development package. Interview data suggested that a beneficial impact extended into the teachers' first year of teaching, and that creative teaching can become a part of teacher identity. The article describes evidence that creative teaching can be fostered and it concludes with a recommendation that teacher training and development should give it explicit attention. Some challenges and potential solutions are described.

Keywords: Creative teaching; teacher development; teacher identity; creative lesson planning; classroom improvisation.

Introduction

The need for teachers who are creative thinkers

A main purpose of education worldwide is seen as preparing students to participate fruitfully in society and lead independent lives (OECD, 2018; Valtonen et al., 2021). To be successful, students will need to construct and apply knowledge, understand and contribute to the solution of problems of the future (Silva, 2009; Van Laar et al., 2020), and make informed and wise decisions (Sadler, 2010; Newton, 2017). However, the widespread use of standardised tests, prescribed curricula, and high-stakes accountability provides tensions for teachers and school leaders in their attempts to meet these aspirational educational outcomes (Olivant, 2015; Keamy, 2016). Habits of thought and practice also add to a teaching inertia which maintains the status quo. Changing how teachers see and engage in their role is fundamental to breaking free from unproductive practices and achieving educational goals. Globally, a teacher's role has changed over time; once seen simply as a knowledge-provider (Nias, 1993), a teacher is now considered to be a learning activator (Hattie, 2012), and designer of meaningful learning tasks that require students to make knowledge-based decisions (Scardamalia et al., 2012). Crucially, for students to be successful, teachers need extensive subject and pedagogical knowledge (Coe et al., 2014), and, for instance, an ability to model purposeful, productive thinking skills and decision-making competencies (Newton & Newton, 2018; Valtonen et al., 2021). However, they also need to be creative problem-solvers in order to meet the diverse learning needs which face them (Tanggaard, 2011; Henriksen, 2016; Beghetto, 2017). Merely repeating last year's lessons is not enough: teaching needs to be creative, responsive and dynamic as students, expectations, and the world change. Furthermore, an open-minded willingness to adapt, and the capacity to do so equips teachers with a frame of mind and skills that will prepare them for the inevitable changes they will meet in their working lives (Clack, 2017). But, can this be done? Can a creative frame of mind and capacity be fostered in teachers?

The nature of creative thinking in teaching

Acar, Burnett & Cabra (2017) reviewed the many definitions of creative thinking and distilled a consensus that it purposefully produces something *new* and of *value* (either to the creator or a wider audience). While these are essential components, successful creative thinking may also produce a kind of *satisfaction*. In the classroom, teachers could use creative thinking to design innovative learning experiences, and to adapt their teaching spontaneously according to students' needs (Paek & Sumners, 2017). Beghetto (2017) highlights these two, distinct roles as the use of creative thinking:

- when planning and evaluating learning experiences, which he describes as disciplined creative teaching; and,
- when responding spontaneously to situations in the classroom in an improvised, on-the-spot, application of creative thinking.

The perception of creative teaching in education has changed over time. In early literature, creative teaching was seen as a performance, a quality possessed by a gifted few (Opulente, 1965) and with a potentially high level of risk (Tanggaard,2011). Now, creative teaching is seen as an appropriate skill for all teachers to develop and use (Cremin, 2015) with wise decision-making minimising the risk (Craft et al., 2008). Current thinking is also moving away from an emphasis on isolated experiences used to maximise students' engagement (Tanggaard, 2011), to the continual use of creative teaching skills to develop effective learning experiences that meet students' needs (Beghetto, 2017). This, however, assumes that a teacher's creative thinking can be developed and used intentionally and successfully (Beghetto, 2017). It is argued that training and opportunities are needed for teachers to understand, acquire, practise, and improve the competence of creative teaching (Henriksen, 2016). Although there is growing interest in the notion of creative teaching, there is little evidence that it is finding a place in training or practice so any potential benefits for both teachers and students may be lost (Henriksen, 2016; Beghetto, 2017). Some may even be sceptical about the value of fostering creative teaching at a time of intense monitoring and measurement of teacher performance in many education systems (Holloway, 2019).

We are of the view that uncreative teaching may support children's learning, but only up to a point. Teaching is an interactive process in which the teacher responds to diverse interests and needs. The creative teacher is more able to prepare, adjust, and improvise teaching to fit these interests and needs, to make the most of the learners' abilities, and maximise their learning. While a competence in creative teaching cannot be transmitted to others, we can provide opportunities to construct understandings and exercise creative thinking through discourse and activities. Accordingly, the aim of this study was to prepare, develop, and test a teacher development package which offered such opportunities. In particular, the package aimed to foster:

- an understanding of the meaning of creative teaching;
- an appreciation of the value of creative teaching;
- competence in creative lesson planning; and,
- notions of the role of the teacher (teacher identity) which include a favourable disposition towards creative teaching.

Method

The materials: a creative teacher development package

Pre-service teacher training is considered a critical time for developing and transforming novice teachers' professional values and identities (Bryson, 2014; Boyd et al., 2015). Consequently, a one-year postgraduate course for primary school, pre-service teachers

in England was chosen as the testing ground for the development package. (English primary schools, for children aged 5 to 11 years, are similar to elementary schools elsewhere). The course focuses mostly on subject and pedagogical knowledge in practice (DfE, 2019). We are unaware of courses which also attempt to develop professional creative thinking in teachers in a systematic and deliberate way (see also Byman et al., 2021).

The construction of the development package was informed by Mezirow's (2000) transformational learning theory. In particular, it pointed to the value of: centrality of experience, critical reflection, and rational discourse. This led to four themes (Table 1). The constructivist approach of the package tasks was intended to support the active creation and interpretation of knowledge in the context of personal experience (Kroth & Cranton, 2014). To enhance the transformational experiences, tasks were structured to enable formative peer discussion, review and feedback, with opportunities for pre-service teachers to gain the perspectives of peers (Nicol, 2014). An illustrative selection of tasks is provided in Appendix A.

Table 1: Themes in the Training Package.

Themes in the pre-service teachers' training package	Types of tasks	Literature used to support the tasks
1) developing an understanding of creative teaching	Critically reviewing and discussing with peers and tutors: former pre-service teachers' video vignettes explaining what creative teaching means to them; video clips of creative teaching in classrooms; relevant literature.	Beghetto (2017) Henriksen (2016)
2) problem-based learning tasks, to practise decision-making and creative thinking skills	Using creative teaching approaches to complete: scenarios tasks; lesson-planning tasks.	Newton (2017) Creative teaching examples in a range of literature (for example Wegerif, 2010).
3) recognising the importance of creative teaching in schools *(Iteration 2 of the teaching package only n=34)*	Critically reflecting on: own examples of disciplined and improvised creative teaching from teaching placements. question and answer session with experienced primary school teachers about creative teaching.	Application of the above.
4) self-analysis of own teacher identity (developments, influences, challenges), and the position of creative teaching within this	Critically reflecting on transformational learning theory and its application to own experiences through: teacher identity tasks: 'What kind of teacher do you aim to be?'; professional developments journal, including influences of peers and reflections on multiple perspectives.	Mezirow (2000) Nicol (2014)

Training packages are unlikely to be optimal in the first instance. A design-intervention strategy (Simon, 1996) was used to design, enact, evaluate and improve the package through two iterations. Teacher feedback and course leader observations informed the revision process.

The participants

An intervention group of 72 pre-service primary school teachers completed the package, providing pre and post-training data. Given that other things happen in teacher training courses which might be said to develop creative teaching competence, data from another 49 pre-service teachers who did not experience this training in a previous year were available for comparison. (A comparison of the two groups' degrees, ages, and experience showed them to be very similar.) There were also the data from semi-structured interviews with five teachers one year after they had completed the training package.

The training procedure

The training package was delivered by a tutor on the course. Experienced teachers also contributed by presenting in live sessions examples and benefits of creative teaching in their practice and the practice of the pre-service teachers they work with. An expert teacher also worked with the lead researcher to validate the quality of the pre-service teachers' examples of creative teaching from their teaching placements (Table 1: Task 3). The creative thinking and practice package was only a part of the overall teacher training course. The package took 42 hours over six days dispersed through the first twenty weeks of the course and comprised:
- interactive online presentations;
- completion of self-study tasks; and,
- live online teaching and discussion sessions.

Task responses were submitted through an online platform and the tutor chose examples for discussion at the live sessions, with the pre-service teachers' consent and input. The structure of the sessions enabled the pre-service teachers to revisit their ideas about creative teaching through a cycle of self-study, discussion with peers and the tutor, and a return to self-study to adjust their understanding according to others' input.

Analysis

These trainee teachers' pre-development and post-development responses to the package included qualitative and quantitative data reflecting the four themes (Table 1). For instance, pre-service teachers submitted written responses to the question: *What is your understanding of creative teaching?* at the beginning and end of the training package. A coding frame (shown in Table 2 below) was used to compare the frequency of the key features of creative teaching that occurred in the pre-service teachers' explanations. The percentages of the teachers' responses were reported. A Chi-square test of independence was used to examine the differences between the pre and post-training understandings of creative teaching. The qualitative data enabled further comparisons and added meaning to the findings.

Results

The following represent data collected from the intervention group of pre-service teachers unless otherwise stated.
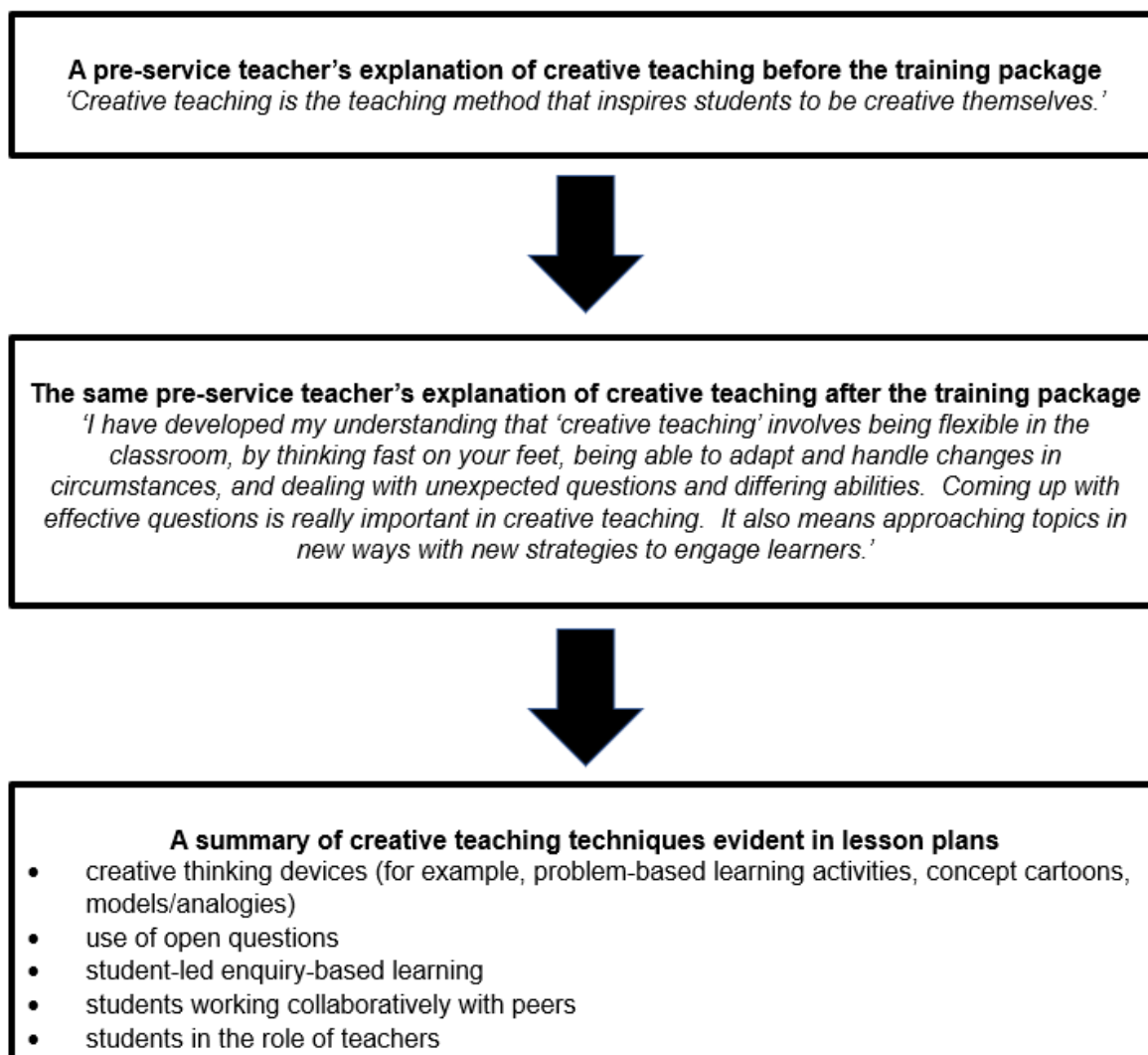
Theme 1: developing an understanding of creative teaching

Table 2 provides strong evidence of statistically significant increases in understandings of the main features of creative teaching after the intervention group of pre-service teachers completed the creative teaching training package, compared with their earlier understandings.

Table 2: A Comparison of Pre-Service Teachers' Understandings of Creative Teaching Before and After their Completion of the Training Package (Intervention Group Data).

Coding Frame		Outcomes			
Feature *Creative teaching means a teacher…*	**Vocabulary/ indicators**	**Percentage of pre-service teachers' responses that included this feature (n=72)**		**P-value significance at *p*<.05 (χ^2 test with 1 df)**	**Example response from pre-service teachers at the end of the training package**
		Before training package	**After training package**		
…has new ideas.	innovative, original, imaginative, new, different, thinking outside the box	36	68	X^2 (1, $N = 72$) = 14.72, *p*<0.001	*'Creative teaching means thinking imaginatively about how you present curricular content, to ensure you deliver engaging and meaningful learning to your students.'*
…is adaptable (disciplined adaptability).	adapt, change, flexible, disciplined, controlled, thoughtful, considered	13	58	X^2 (1, $N = 72$) = 33.06, *p*<0.001	*'It is important to be able to adapt to changing situations, in a well-thought out and controlled way.'*
…is adaptable (improvised adaptability).	adapt, improvise, unpredictable, spontaneous, disruption	8	57	X^2 (1, $N = 72$) = 38.69, *p*<0.001	*Creative teaching is the ability to adapt a lesson on the spot, for example if there is a disruption of some kind.'*
…is thinking/ acting creatively in a holistic way.	teachers thinking /acting creatively in a holistic way, to solve problems.	25	57	X^2 (1, $N = 72$) = 15.19, *p*<0.001	*'Creative teaching is the teacher being dynamic, problem solving and imaginative. It is not limited to subjects or age groups. It is involved in every step of a learning experience, from planning the methods used in the lesson to deliver the learning, the content, the outcomes and the way feedback is given.'*
…recognises the value of creative acts.	Teachers meeting learning outcomes; students' needs; teachers' gains.	14	42	X^2 (1, $N = 72$) = 13.85, *p*<0.001	*'Creative teaching encompasses a teacher's ability to be prepared to adapt the lesson spontaneously to meet the needs of the students.'*
…is open-minded when acting creatively.	open-minded, ready for change, dynamic, willingness to transform	8	31	X^2 (1, $N = 72$) = 11.35, *p*<0.001	*'Creative teaching refers to the multidimensional nature of teaching, meaning the need to be flexible and open-minded in everyday teaching practice to maximise students' development.'*

After the training package, many pre-service teachers in the intervention group changed their explanations of creative teaching by focusing on their use of creative thinking to develop as effective teachers, rather than only focusing on the creativity of their students. An example of this change is in Figure 1:

A pre-service teacher's explanation of creative teaching before the training package
'Creative teaching is the teaching method that inspires students to be creative themselves.'

The same pre-service teacher's explanation of creative teaching after the training package
'I have developed my understanding that 'creative teaching' involves being flexible in the classroom, by thinking fast on your feet, being able to adapt and handle changes in circumstances, and dealing with unexpected questions and differing abilities. Coming up with effective questions is really important in creative teaching. It also means approaching topics in new ways with new strategies to engage learners.'

A summary of creative teaching techniques evident in lesson plans
- creative thinking devices (for example, problem-based learning activities, concept cartoons, models/analogies)
- use of open questions
- student-led enquiry-based learning
- students working collaboratively with peers
- students in the role of teachers

Figure 1: Creative Teaching Understandings and Techniques.

The pre-service teachers' understandings of creative teaching also moved away from the misconception of an arts focus by the end of the training package. An understanding of the connection between creative teaching and transdisciplinary skills had also increased, for example:

'I want to ensure that I am always thinking from the point of view of the students – through embodied thinking - and how an activity will come across to them, to ensure that it actually meets the objective and is engaging.'

Theme 2: problem-based learning tasks, to practise decision-making and creative thinking skills

Pre-service teachers in the intervention group completed a theoretical-lesson planning task to apply their understandings of creative teaching to their potential practice. Pre-service teachers' designs of two primary science lessons completed before the training package (Lesson Plan 1) and after the training package (Lesson Plan 2) were analysed, to enable a

statistical comparison of frequency of creative teaching techniques. The results suggested that there was evidence of a statistically significant increase in the use of the creative teaching features in Figure 1 in Lesson Plan 2 compared to Lesson Plan 1 (a χ^2 test with 1 df returned $p<0.001$).

The comparison group of pre-service teachers who had not completed the training package completed the same task of creating a lesson plan for science as a routine part of their training. The same statistical data analysis method (χ^2 test with 1 df) was applied to the science lesson plans from the comparison group. This enabled a comparison of statistically significant differences between those who received the teaching package and those who did not. For the comparison group, the results ranged from $p = 0.32$ to $p = 1.00$, suggesting that there was no evidence of a statistically significant increase in the use of the creative teaching features listed in Figure 1. This counters the argument that the observed effects were due to other events on the course.

Pre-service teachers in the intervention group also completed scenarios tasks in the training package, giving reasoned solutions to a range of teaching problems. For example, pre-service teachers were given a scenario in which student 'David' struggled to start his drawing of a spider's web in an art class. Pre-service teachers responded to the question: 'What would you have done to help David to start his drawing?' by presenting a possible solution and an explanation of their decision.

The solutions varied from:
- asking David a question:
  'I would have asked David if he had ever seen a spider's web, and what was the biggest spider web he has ever seen?'
- to working with a partner:
  'I might also encourage David to work with a peer to create a spider's web together.'
- to responding to the clues in the scenario's explanation of David's needs:
  'I would have given David the time he needed to plan the task in his head, (which I think he was doing - visualising drawing a web by moving his eyes from left to right).'

Analysis of the pre-service teachers' responses to the spider's web scenario, and other similar tasks, suggested that there were three main areas in which these activities developed the pre-service teachers' professional skills:
1. Creative thinking: pre-service teachers practised the skill of designing a solution and response to solve a teaching problem;
2. Critical thinking and reasoning: pre-service teachers made and justified their decisions; and,
3. Gaining multiple perspectives of different (sometimes contrasting) approaches to the task: peers explained their decisions to others.

Theme 3: recognising the importance of creative teaching in schools

In Iteration 2 of the training package, pre-service teachers in the intervention group (n=34) submitted examples of disciplined and improvised creative teaching from their teaching placement lesson plans, which occurred after the final training package session. The task included self-reflections on the benefits of their creative teaching approaches. The examples of creative teaching were rated by the tutor and an expert teacher for creative teaching quality, to explore the pre-service teachers' capacities to apply the training package to their practice. The rating criteria incorporated Acar et al's (2017) explanation of creativity

(a novel approach which attempted to solve a problem), alongside the creative teaching techniques in Figure 1.

In all the responses submitted, the pre-service teachers viewed their use of creative teaching as an essential skill needed to solve a problem in their practice. Problems included: changing the teaching approach to enable students to understand the learning outcome; creating a new resource to model a concept, and designing a learning experience to increase students' engagement.

A rating between 1-5 was then assigned to each example (with 5 being highest rating). Although the quality of the creative teaching examples varied, the mean ratings of 3.4 (disciplined creative teaching) and 3.2 (improvised creative teaching) out of a maximum of 5 suggested that the pre-service teachers were developing their creative teaching skills in the context of real teaching placement experiences.

In the highly rated examples of improvised creative teaching, pre-service teachers moved away during the lesson from a pre-planned closed teaching input (for example, lengthy teacher-led explanations, or a highly scaffolded worksheet) to spontaneous modelling, increased student-led opportunities, or a more practical task. The highly rated examples of disciplined creative teaching demonstrated pre-service teachers using their creative thinking skills to maximise effective teaching, including planned open-ended questioning, and thought-provoking resources. Pre-service teachers' strong subject knowledge was reflected in the highest rated examples of creative teaching: it was apparent that this enabled them to think of imaginative alternative approaches.

Pre-service teachers in the comparison group who did not receive the training package also prepared and evaluated lesson plans at a comparable time in the course. The numbers of ideas for adapting each lesson to solve a learning problem were recorded, and Table 3 compares these results with the intervention group. Again, the difference between the two is statistically significant. The pre-service teachers who completed the creative teaching training package identified more adaptations for their lessons than pre-service teachers who did not have that opportunity. This is further evidence that the training package had a positive effect.

Table 3: A Comparison of Pre-Service Teachers' Number of Suggested Adaptations in Lesson Evaluations

	Intervention Group (n=34)	Comparison Group (n=49)	Comparison (χ^2 test with 1 df)
Mean	3.03	1.61	$p<0.001$
Standard Deviation	1.60	1.19	Cohen's $d = 1.00$ (generally taken to indicate a large effect size)

Theme 4: self-analysis of own teacher identity

Before receiving the training package, pre-service teachers in the intervention group described their perceived teacher identities through a written response to the question: 'What kind of teacher do you aim to be?' They revisited this question after the training package, by adjusting their written responses and explaining the influences on their adjustments.

A comparison of the two responses (Table 4) showed a large increase in the inclusion of creative teaching features after the pre-service teachers in the intervention group had completed the training package.

Table 4: Use of Vocabulary Associated with Creative Teaching, in Pre-Service Teachers' (n=72) Teacher Identity Responses Before and After the Training Package (Intervention Group Data)

Vocabulary Associated with Creative Teaching	Frequency of Vocabulary Used in Pre-service Teachers' Teacher Identity Responses	
	Before training package	After training package
creative, innovative, imaginative, adaptable, flexible, thinking outside the box, try new things, risk, embodied thinking, play, spontaneous, open-minded	42 occurrences	176 occurrences

42% of these teachers in included the term 'creativity' as an ideal quality for their teacher identity before the training package, compared to 94% after completing the training package. They explained why this change had occurred, for example:

'My development this term has taught me to change direction if things are not going to plan. I have learnt various ways to become a creative teacher to ensure children are engaging in meaningful and exciting learning experiences. I have learnt many different strategies of teaching and learning, which will allow me to hopefully solve various problems which I will encounter as a teacher. One of the biggest things the [training package] has taught me is to think outside of the box when teaching, always ensuring the children are at the forefront of every lesson, but to not be afraid to take risks, and to learn from mistakes.'

Many in the intervention group referred to the intention of the training package – to make creative teaching a conscious and deliberate decision-making tool – in their reflections about their teacher identities at the end of the course, for example:

'Although disciplined and improvised creative teaching may have occurred naturally in my practice, by having it explicitly explained ensured that I made a conscious effort to be creative both in planned and unplanned circumstances. This module made creative thinking go from a subconscious level (where it occurs instinctively, but perhaps with less thought and effort involved) to a conscious level (where teaching and learning opportunities are thoroughly thought about using creative thinking skills). I genuinely believe it [the training package] has allowed me to make more, and better, creative teaching choices both spontaneously and non-spontaneously."

All acknowledged that their teacher identity would need to be adapted according to their future contexts, for example:

'Some [aspects of my teacher identity] will keep going in the same direction and some will be challenged. I realise that over time in practice my teacher identity attributes will look a bit different to how I initially imagined'.

They also reported that the task to complete a self-reflective journal (to help the pre-service teachers to monitor the development of their teacher identities) was beneficial to their professional development, for example:

'I never considered the usefulness of a journal [before the PGCE course]. It has allowed me to self-reflect at the end of each day and sum up what I've learned and found the most useful. I aim to continue with my self-reflective journal [after this term], to help me to keep exploring new ways to teach creatively and teach for creativity.'

Indications of sustainability

Five former pre-service teachers who completed Iteration 1 of the training package were interviewed towards the end of their first year of teaching. The semi-structured interviews aimed to explore indications of sustainability of a creative teaching approach. All teachers said that the training package had continued to influence their professional development after their training, and that a creative teaching approach was an essential part of their teacher identities, for example:

'My idea of creative teaching now is definitely what I was left with at the end of the PGCE year and had developed from the [training package] sessions. Those sessions changed my way of thinking about creative teaching and are why this is now embedded in my teacher identity.'

These teachers used vocabulary such as: *'integral', 'under-stated', 'constantly'* and *'subtle'* related to their creative teaching approaches. This suggested that creative teaching was in action continually in everyday 'improvised' teaching acts, evident in this example:

'Adapting during every lesson has been really important: I am never flustered if something goes wrong as I will think of some other way of teaching it, which I think is directly from what we were taught [in the training package].'

Contrary to some of the pre-service teachers' views (explained in Theme 4), the teachers discussed a change in their creative thinking skills from a very deliberate 'conscious level' as a pre-service teacher to a more 'sub-conscious' level as an early career teacher, suggesting that this had become an embedded quality.

All five teachers discussed the use of a creative teaching approach to reduce the negative impact of the Covid-19 global pandemic on students' learning experiences. For example:

'I think creative teaching is especially important this year, as the students have missed so much [due to school closures]. You are constantly, unexpectedly, filling in gaps because they don't have the prior knowledge you'd expect from the previous year.'

A barrier raised by some of the teachers to a disciplined creative teaching approach was the time needed to plan creative teaching ideas. However, one teacher provided a contrasting argument to the issue of time in his response, as he viewed a disciplined creative teaching approach to be time-efficient for the teacher:

'You don't have time to not be creative. There is no point just using workbooks or textbooks as the students won't get it. If you aren't creative, then you'll have to repeat [the lesson] again in a different way, and you'll have to be creative anyway – there's an inevitability! Why not be creative from the first lesson?'

Discussion

This study was situated in a real-world context of an initial teacher training course, with many other influences on the pre-service teachers' developments during their training year. Nevertheless, the responses to the package showed encouraging and potentially useful changes in beliefs and creative teaching competences. Furthermore, comparisons with those who were not trained in this way provided evidence that these changes were due to the experiences provided by the package. To this extent, the training package achieved these ends.

We also point to the value of the iterative process in developing to the package. For example, a change from Iteration 1 to 2 was the addition of Theme 3, 'Recognising the importance of creative teaching in schools', due to an emergence of pre-service teachers' queries about the value of creative teaching in many of today's schools where the emphasis can be on test scores.

The following discussion points explore some of the themes presented in the introduction in relation to the results from the pre-service teachers in the intervention group.

Analysis of pre-service teachers' written responses to the training package tasks suggested that their understandings of creative teaching changed between the beginning of their teacher training course and the end of the creative teaching training package. The pre-service teachers showed a significantly increased understanding of the need for a teacher to adapt, and think creatively in an immersed, holistic way, instead of viewing creative teaching as isolated opportunities. This aligns with the current role of a teacher: to continually adapt their teaching to respond to students' needs and the changes in the education systems in which they work (Clack, 2017). The quality of open-mindedness was discussed by some pre-service teachers, alongside the generation of new ideas, suggesting their readiness to transform (Mezirow, 2000). Pre-service teachers in the intervention group also changed their misconceptions of creative teaching at the end of the training package, adjusting their ideas to align with the current understanding of creative teaching as transdisciplinary across subjects and age phases (Henriksen, 2016).

The problem-based learning tasks allowed the pre-service teachers to practise their decision-making and creative thinking skills. The pre-service teachers' outcomes reflected the three main features of Mezirow's (2000) transformational learning theory, summed up in the table below:

Table 5: Features of Mezirow's Transformational Learning Theory, Matched to the Problem-Based Learning Tasks of the Training Package.

Features of Mezirow's transformational learning theory	Training package opportunity	Pre-service teachers' skill developments
centrality of experience	developing a response to solve a real-world teaching problem	• creative thinking • decision-making competencies
critical reflection	justifying their response decision	• critical thinking • reasoning
rational discourse	Explaining their response decision to others (peers, tutors)	• gains through multiple perspectives (ideas, viewpoints) • communication • negotiation

In the 'hypothetical scenarios' tasks there was evidence of an increased use of creative teaching techniques, as discussed by Henriksen (2016) and others, with greater use of open questions, creative thinking tools and student-led learning opportunities. Pre-service teachers' explanations for their decisions demonstrated that they understood the value of creative teaching: to maximise the effectiveness of students' learning experiences (Beghetto, 2017). The scenarios tasks were completed in university-based sessions, without a specific school context. Aligning with Boyd et al's (2015) view, these tasks allowed the pre-service teachers to create thoughtful and innovative responses, in an environment of peer and tutor support. We considered this to be an important step: to allow ideas to emerge and be adjusted according to the perspectives and feedback of others, through the peer and self-review approaches advocated by Nicol (2014), before the context of teaching placements.

The pre-service teachers' application of creative teaching skills during teaching placements provided them with the experience of understanding the need to adapt their behaviours according to specific school contexts and parameters (Paek & Sumners, 2017). Encouraging pre-service teachers to reflect upon their use of creative thinking skills in two contexts - disciplined (lesson-planning) and improvised (in-class) - enabled them to recognise the value of creative teaching in the two ways discussed by Beghetto (2017). By reflecting on their creative practice, many pre-service teachers realised that a creative teaching approach could be essential to their professional success, due to its value to the learning experiences of their students (Cremin, 2015).

Strong subject and pedagogical knowledge was identified as a key determining factor of a pre-service teacher's ability to successfully adapt a lesson (both in preparation and improvised contexts). Although a teacher's role has moved from knowledge provider to learning activator (Hattie, 2012), the results suggested that strong subject knowledge enabled the pre-service teachers to create the most effective learning experiences, both at the planning stage and spontaneously in-class (Coe et al., 2014).

In the intervention group, the pre-service teachers' increased focus on creative teaching in their teacher identities was reinforced during the interviews with the Early Career Teachers after a year of teaching. Agreeing with Beghetto (2017), the Early Career Teachers focused on creative teaching as an essential everyday teaching skill. A shift from a conscious approach to subconscious suggested that creative teaching had possibly become embedded in the Early Career Teacher's identity and professional practice, and there were indications that this had been a transformational process for some Early Career Teachers. However, Early Career Teachers indicated that their use of deliberate creative teaching depended upon the teaching approaches valued by school leaders (see also Keamy, 2016).

The interviews with Early Career Teachers brought attention to contexts when creative teaching may not be appropriate: this may depend upon the senior leadership team's vision, values and priorities (Keamy, 2016). To address this issue, a part of the development package aims to help pre-service teachers understand the aspects of creative teaching that may become embedded in all teachers' identities (for example, thinking of new ideas to meet students' needs) regardless of their future schools' priorities. Recognising the difference between prepared and improvised creative teaching - and the potential value of each – may help with this. But it also points to a need to extend understandings of creative teaching to senior leaders in schools.

Conclusion

In a digital world where machines do more of the mundane tasks, creative thinking is being seen as a valuable, human asset and at a premium in both in the workplace and in everyday life. It may even help teachers adapt to change more successfully and less stressfully (James et al., 2019). This was a study of the effect of training pre-service teachers destined to teach younger children. There was evidence that it increased understandings of creative teaching, it enhanced competence in creative lesson planning and delivery, and it changed how teaching was perceived. While we cannot compel would-be teachers to think creatively, we saw in this study evidence that by fostering pre-service teachers' understanding of what it means to be a creative teacher, by exercising the creative processes, by helping them to see creative teaching competence as an asset and a part of a teacher's identity, it is possible to increase the likelihood that they will display this competence in the classroom and continue to value it.

It remains to be seen if this will be successful with other groups of teachers, such as pre-service secondary school teachers and in-service teachers. But, teachers may meet obstacles to using their new-found competence. For instance, it is challenging to develop the skill of creative teaching in isolation, and some school leaders may not prioritise it if they do not recognise its value to the students' needs. We suspect that it may help if school leaders also had the opportunity to familiarise themselves the aims and nature of creative teaching. Creative teaching has a risk-taking aspect – a new idea is being tested and it might not always be successful. We have discussed that helping pre-service teachers to develop their decision-making competencies, and strong subject and pedagogical knowledge, may alleviate this concern. We recommend that teacher trainers consider providing a safe space for teachers to test creative teaching ideas, and develop an understanding of the value of this skill for the long-term benefit of themselves and their students.

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About the Authors

Rachel Simpson is an Associate Professor of Education at Durham University, UK. She specialises in training teachers and science education. Her current research focuses on the notion of creative teaching and the creative teacher. She has delivered a range of presentations and workshops, nationally and internationally, on this theme, and has developed teacher training materials to support teachers' creative thinking skills. Other research interests include the use of peer review as a formative assessment tool in higher education and students' development of academic writing skills.

Douglas P. Newton, *Ph.D.*, *D.Sc.* is a professor working in the School of Education at Durham University, Durham, UK, DH1 1TA, where he trains teachers, teaches on higher degree courses, supervises research students, and is a mentor to colleagues working in a variety of disciplines. His interest is in the notion of purposeful thought and how to make the most of it. Two recent books on the subject are: *Teaching for Understanding* and *Thinking with Feeling* (Routledge). More recently there are: *In Two Minds* (ICIE), *Creative Thinking in University Physics Education* (with S. Nolan and S. Rees, Institute of Physics), *Creative Chemists* (with S. Rees, Royal Society of Chemistry), and *Mentoring Academics: A guide for busy mentors in higher education* (VU University Press). For a broader account see: Profiles of Creativity, *International Journal for Talent Development and Creativity*, 2019, vol. 6, pages 211-219.

Lynn Newton is Professor of Education and Head of the School of Education at Durham University, UK. Her research interests are in the areas of questioning and explaining related to purposeful thinking, particularly for creativity (e.g. *Questioning: A Window on Productive Thinking* (ICIE)). She is currently exploring the relationship between understanding, creativity and productive thought. She has published over a dozen books and over 100 papers on these areas. Recently she was a member of the research team on the Durham Commission for Creativity and Education, a collaborative project with ArtsCouncil England, and a co-author of the 2019 Commission Report.

Addresses

Rachel Simpson;
School of Education, Durham University;
Leazes Road, Durham, UK. DH1 1TA., England

e-Mail: rachel.simpson2@durham.ac.uk

Prof. Dr. Douglas P. Newton;
Schoold of Education; Durham University; Leazes Road;
DURHAM DH1 1TA, England.

e-Mail: D.P.Newton@durham.ac.uk

Lynn Newton, *MA, Ph.D.*
Professor of Primary Education
Durham University; School of Education; Leazes Road
DURHAM DH1 1TA
England.

e-Mail: l.d.newton@durham.ac.uk

Appendix A: an illustrative selection of tasks

Table 6: Themes in the Training Package and Examples of Tasks.

Themes in the training package	Illustrative task
1) developing an understanding of creative teaching (1 example of 9 tasks)	**A Review of a Former Pre-Service Teacher's Explanation of Creative Teaching** *'Watch the video clip of a former pre-service teacher's example of creative teaching, and be prepared to discuss the following questions with peers and the tutor:* *What are the possible benefits and challenges of this creative teaching approach – for the teacher and the students?* *Which transdisciplinary skills are evident in this approach?* *How often / When would you consider using a similar approach?'*
2) problem-based learning tasks, to practise decision-making and creative thinking skills (1 example of 8 tasks)	**A Scenario Task** *The Spiders' Web Drawing scenario (explained in the main article).*
3) recognising the importance of creative teaching in schools *(Iteration 2 only)* (1 example of 4 tasks)	**Reflecting Upon Own Examples of Disciplined and Improvised Creative Teaching from Teaching Placements.** *'Select an example from your teaching placement of your disciplined use of creative teaching skills and your improvised use of creative teaching skills, explaining why these are examples of creative teaching. Attach some evidence that supports your answer (for example, an annotated lesson plan or evaluation).'*
4) self-analysis of own teacher identity (developments, influences, challenges), and the position of creative teaching within this (1 example of 7 tasks)	**Self-Reflective Journal Task**: *'Each week on the course, take time to think about the development of your ideas on this journey as you become a teacher. Think about your views of learning, and the learning environment. Are your ideas changing? Why? What are the influences? How do you feel about the change?* *Record your thoughts in a format of your choice: a diary, a blog, a learning log, an emotions graph. Be prepared to share your record with your peers and tutor.'*