The changing role and competences of teachers

Gaps in teacher education provision

Roger Blamire, Katja Engelhardt, Janet Looney

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ABSTRACT

Teach-UP (http://teachup.eun.org/) is a policy experimentation running from 2017 to 2020 involving partners in ten countries. The project focuses on building teachers’ competences for today’s schools, bringing closer together Initial Teacher Education (ITE) and Continuing Professional Development (CPD), and exploring innovative training methods, in particular online courses. During the project questions related to self-regulated learning, tutoring models, peer assessment and conditions for certification are being investigated.

National public authorities (i.e. ministries of education and national agencies) partnering in Teach-UP agreed to focus the online courses to be offered specifically on teacher collaboration, personalised learning, formative assessment and creativity. The focus in WP1 was therefore specifically to identify the gaps in ITE and CPD provision in these four priority areas by means of a consultative survey, a literature review, complemented by a background paper on Self-Regulated Learning – the latter is available in a separate document.

The consultation took place in the first four months of the project and captured the views of 425 providers of teacher education in ten countries and assessed the extent of online training and their perception of the extent to which their organisation covers the four competences.

The literature review provides project partners and others with an overview of findings from research on the four topics, provides an evidence-based foundation for the subtopics within each competence in the consultation survey and serves as a background to the online courses to be developed in the Teach-UP project.

The Annex includes the English language version of the consultation survey and notes from partners on national definitions of collaboration, creativity, formative assessment and personalisation.

This document is Deliverable 1.1a of the project.
1 CONSULTATION SURVEY: GAPS IN PROVISION

Roger Blamire, European Schoolnet

1.1 METHODOLOGY

The Teach-UP Scientific and Advisory Committee (SAC) designed an ITE and CPD Provision Questionnaire. The aim of the survey was to identify any gaps in ITE and CPD provision in four priority areas:

- Formative assessment
- Personalisation and differentiation
- Nurturing collaborative problem-solving
- Nurturing creativity

The questions were validated by all partners and revised. The survey was then translated into the languages of the participating countries (German, Estonian, Greek, Hungarian, Lithuanian, Portuguese, Slovakian, Spanish and Turkish, as well as English) and the translations validated by each partner. After revision, the survey was created online in ten different language versions, using SurveyMonkey. The English version is in Annex 1 and here: https://www.surveymonkey.com/r/JVTD9NZ.

The survey was open until 22nd May 2017. National partners in each country contacted providers of ITE and CPD by email and invited them to complete the survey, sending follow-up encouragement if responses were low.

The raw data were then cleaned (incomplete or duplicate answers were deleted) and aggregated in a single Excel spreadsheet for analysis.

1.2 RESULTS: GENERAL

In total 425 valid responses were received (fig. 1). This is a significant proportion of the total number of providers in the ten countries, although the actual population of all providers is not known.
Almost 50 percent of respondents were from Spain (or countries with Spanish training centres, e.g. United Kingdom, Guatemala), while just 0.5 percent of respondents were from Malta (two organisations). In order to balance the range of views responses were weighted to give each country equal value, regardless of the size of the country or the number of responses. The following charts are displayed using this data. In fact, not weighting data does not alter the results very much, in most cases slightly reducing the variation between responses.

Figure 2 shows the type of training provider: 36 percent of respondents work in national agencies and slightly fewer (31%) work in universities or higher education institutions.

Although all types of provider are represented in the responses, only four percent work in private companies and one percent in teacher associations, networks or unions.
The survey asked what level of training was provided by their organisation. As can be seen in fig. 3, in most cases (54%) it is CPD.

![Figure 3: Level of training provided](image)

Initial Teacher Education is provided by 12 percent of respondents' institutions, while in one-third both ITE and CPD is provided. It is of course possible to further analyse answers separately for ITE and CPD to investigate any differences in gaps and patterns of responses, but the intention of Teach-UP is not to treat the two groups separately.

The project partners wanted to find out if teacher education was provided online and fig. 4 shows how respondents answered. Some 62 percent said that training was blended, a mix of face-to-face and online, possibly suggesting that in these days of ‘always on’ internet access it is no longer possible to differentiate between on- and offline working.
However, in 37 percent of respondents’ institutions training is only face-to-face, with no online element. Only one percent of respondents (all in Spain) stated that training is online with no face-to-face components. It is therefore clear that the current pattern of teacher education is overwhelmingly in person and that purely online training is still in its infancy.

Given the current pressure to ensure that beginning teachers experience real classroom life, we asked what proportion of time teachers on training courses spend in schools, either observing or teaching. Fig. 5 shows the results.
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Figure 5: Proportion of time spent in school

The results indicate quite a divide. One-third of respondents state that less than ten percent of trainees' time is spent in school, suggesting that the training may be rather theoretical. A further 31 percent say that between ten and 20 percent of time is spent in school. On the other hand in seven present of respondents' organisations more than 60 percent of time is actually spent in schools. Further analysis might indicate if there are country or provider type differences, for example do universities tend to provide courses with low school experiences?

Project partners wanted to know how much time teachers spent online, at the organisation or in school, in order to find out whether working online is general or the exception. Fig. 6 shows how people responded.
Many respondents (16-23%) said it is not possible to say or that the proportion varies. Having said that, it is clear that much time is spent at the providing organisation (31% say that teachers spend over 60 percent of their time there), while 11 percent are in school and nine percent online for over 60 percent of their time. Working online is nevertheless a feature of teachers’ training, at least to some extent. This suggests that some teachers are familiar with the processes, networks and culture of online professional development.
1.3 RESULTS: COMPETENCES

As previously mentioned, the consultation aimed in particular to determine gaps in provision related to the four teacher competences for which training in Teach-UP online courses is to be provided, namely formative assessment, personalisation and differentiation, nurturing collaborative problem-solving and developing creativity.

For each competence, three questions were asked:

- Does your institution do enough to develop this competence?
- How is this competence developed?
- To what extent is training in sub-competences provided?

1.3.1 Formative assessment

To question 6 of the survey, 64 percent partially or strongly agreed that their organisation provides sufficient opportunities to develop teachers’ competence in the formative assessment of students’ learning (fig. 7).

6) "This organisation provides sufficient opportunities to develop teachers’ competence in the formative assessment of student learning.”

To what extent do you agree with this statement?

![Figure 7: Formative assessment training](image)

Just one in four, 24 percent, disagreed or strongly disagreed that their organisation adequately covered this topic.

However, the mean across the countries hides national differences. Fig. 8 shows the percentage (unweighted) in each country disagreeing or strongly disagreeing with the statement, i.e. considering that the topic is not adequately covered.
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Figure 8: Dissatisfaction with current provision - by country

This clearly indicates that a majority of training providers in Greece and Hungary, and to a lesser extent in Estonia and Spain, consider that formative assessment could be better covered. For the purposes of the Teach-UP project online training scope and content, it is the overall figure that matters, but these national differences should be taken into account when considering adoption rates and local needs.

The second question asked how institutions support training in formative assessment. Fig. 9 shows that it takes place, either optional or compulsory, as part of teaching practice, integrated within courses as a specific topic and as part of general didactics teaching, and through course work on the competence.

Figure 9: How formative assessment is taught
Online training is the exception, with only 6-9 percent of respondents saying that online training takes place. When compulsory, training is most likely to be integrated within courses on specific subjects or on general didactics.

Question 8 is a key question for this project. It lists elements of the competence and asks respondents to state to what extent (expressed as a percentage of the total course) their training covers these topics. The elements are drawn from the research on the topic (described in a later section of this report). The pattern of responses was expected to reveal gaps in provision that could be addressed in the Teach-UP online training.

![Figure 10: Gaps in provision](image)

There are no clear gaps, as seen in fig. 10, in the sense that providers considered that no training at all was offered in a particular topic. However, taking a threshold of 20 percent as indicating that a topic is covered only to a small extent, then three topics emerge:

- Using technology platforms that support student interaction and self- and peer-assessment (60 percent of respondents fall into this category)
- Diagnosing sources of learner misunderstanding (44% of respondents)
- Creating classroom cultures to encourage interaction and use of assessment tools (41% of respondents)

On the other hand, topics that are relatively well covered (over 40 percent) are:

- Structuring classroom dialogue and questions to engage learners, provoke thought and identify misconceptions (49% of respondents are in this category)
- Providing feedback that is timely, task-focused and appropriate to the student’s level (38%)
In some cases there is a split. For example, ‘Using evidence of student learning to develop next steps in teaching’ is considered poorly covered by 34 percent and well covered by 37 percent. Further work might reveal if this correlates with countries or type of institution.

1.3.2 Personalisation and differentiation

As in the previous topic, most respondents consider that their organisation does enough to develop teachers’ competence in this area, as seen in fig.11 with 61 percent agreeing or strongly agreeing with the statement.

![Image of survey results]

“In my view, this organisation effectively develops teachers’ competences for personalisation and/or differentiation of learning.”

To what extent do you agree/disagree with this statement?

- Strongly disagree: 15%
- Disagree: 16%
- Neither agree nor disagree: 8%
- Partially agree: 44%
- Strongly agree: 17%

Figure 11: Coverage of the topic

Again, a significant minority (24 percent) disagreed or strongly disagreed with the statement, indicating that there is a gap in provision for some people and in some institutions.

Typically, teacher competence in personalisation and differentiation (fig.12) is taught as a compulsory element in a subject-based course (this is the case for 41 percent of respondents), or a general course (38 percent).
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10 How does your institution support teacher competence development in personalisation/differentiation?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>As part of teaching practice for student teachers</td>
<td>43%</td>
</tr>
<tr>
<td>Optional</td>
<td>33%</td>
</tr>
<tr>
<td>Compulsory and face-to-face</td>
<td>6%</td>
</tr>
<tr>
<td>Compulsory and online</td>
<td>18%</td>
</tr>
<tr>
<td>Integrated within courses on specific subject areas (e.g. teaching and...)</td>
<td>33%</td>
</tr>
<tr>
<td>Optional</td>
<td>41%</td>
</tr>
<tr>
<td>Compulsory and face-to-face</td>
<td>10%</td>
</tr>
<tr>
<td>Compulsory and online</td>
<td>16%</td>
</tr>
<tr>
<td>Integrated within courses on general didactics</td>
<td>37%</td>
</tr>
<tr>
<td>Optional</td>
<td>38%</td>
</tr>
<tr>
<td>Compulsory and face-to-face</td>
<td>8%</td>
</tr>
<tr>
<td>Compulsory and online</td>
<td>16%</td>
</tr>
</tbody>
</table>

Figure 12: How competence in personalisation and differentiation is developed

Compulsory online courses on the topic are provided in eight to ten percent of respondents’ organisations.

Turning to gaps in provision, again respondents generally felt that all the sub-topics were covered, at least to some extent, as seen in fig. 13.

11 To what extent do courses include these competences in personalisation/differentiation?

<table>
<thead>
<tr>
<th>Competence</th>
<th>0 - 10%</th>
<th>10 - 20%</th>
<th>20 - 40%</th>
<th>40 - 60%</th>
<th>Over 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating collaborative partnerships within and beyond schools to support student learning</td>
<td>16%</td>
<td>24%</td>
<td>28%</td>
<td>13%</td>
<td>19%</td>
</tr>
<tr>
<td>Promoting collaborative and real-world project-based learning opportunities (possibly enhanced with digital tools and content)</td>
<td>9%</td>
<td>11%</td>
<td>41%</td>
<td>17%</td>
<td>22%</td>
</tr>
<tr>
<td>Developing a repertoire of activities and assessment procedures appropriate for diverse learner needs and interests</td>
<td>11%</td>
<td>17%</td>
<td>36%</td>
<td>16%</td>
<td>19%</td>
</tr>
<tr>
<td>Managing learning environments to allow time for differentiated learning</td>
<td>12%</td>
<td>20%</td>
<td>32%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td>Knowledge of pedagogies appropriate for learners’ culture, language, socio-economic background, special education needs</td>
<td>16%</td>
<td>20%</td>
<td>25%</td>
<td>24%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Figure 13: Gaps in provision
Relatively more time is spent on:

- Knowledge of pedagogies appropriate to learners’ culture, language, socio-economic background or special educational needs (40 percent consider the topic to be at least 40 percent covered adequately)
- Promoting collaborative and real-world project-based learning (39 percent)

Only 32 percent (19+13%) consider that creating collaborative partnerships within and beyond schools is covered in depth.

Courses tend not to include:

- Creating collaborative partnerships within and beyond schools to support student learning (40% under 20%)
- Knowledge of pedagogies appropriate for learners' culture, socio-economic background and special education needs (36%)

It therefore appears that opinions are divided on knowledge of pedagogies appropriate to learners' culture, language, socio-economic background and special educational needs. One can postulate that either some organisations cover the topic well, others don't, or that some respondents perceive the topic to be well covered while others don't – a question of subjective judgment.

1.3.3 Nurturing collaborative problem-solving

This third competence of today’s teacher is also considered to be effectively covered by most ITE and CPD training providers – 63 percent agreeing or strongly agreeing that their organization effectively develops competence to support collaborative problem-solving among learners (fig. 14).

![Figure 14: Coverage of the topic](image)

12) “In my view, this organisation effectively develops teachers’ competence to support collaborative problem-solving among learners.”

To what extent do you agree/disagree with this statement?

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Partially agree
- Strongly agree

As in the previous topics, there is some dissent; in this case 20 percent strongly disagree with the statement.
The topic is covered face-to-face, both within subject and general courses, and there is an equal divide over whether the topic is optional or compulsory (fig. 15).

![Figure 15: How the competence is developed](image)

As for other competences, a small percentage (7-9%) of respondents say that their organisation provides the training online.

Not surprisingly, as for the other competences, there is less activity in supporting the development of this competence as part of teaching practice – although it could be being developed implicitly, and not tracked or monitored, in the course of the teacher's work with students.

As for gaps in provision, fig. 16 shows that, overall, no obvious gap emerges, as in all four competences.
Topics considered to be relatively well covered are Nurturing student communication skills, followed by Developing a repertoire of structured activities and Monitoring and giving feedback.

Topics less well covered are:

- Monitoring and giving feedback to students on collaborative processes and outcomes (42% consider that it is covered only to an extent of up to 20 percent)
- Developing a repertoire of structured activities (37%)
- Supporting students’ use of collaboration technologies (37%)

Again, there appears to be a divide between those who consider some topics well covered and those who consider the same topic to be poorly covered.

1.3.4 Results: Nurturing creativity

As for the other three competences, a majority (60%) of respondents agree or strongly agree that their organisation effectively develops teachers' competence to nurture learner creativity (fig. 17).
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15) “In my view, this organisation effectively develops teachers’ competence to nurture learner creativity.”
To what extent do you agree/disagree with this statement?

![Survey Results]

23 percent hold the view that their organisation does not effectively develop this competence, either disagreeing or strongly disagreeing with the statement.

Developing students' creativity is an optional element in 39 to 42 percent of respondents’ institutions and compulsory face-to-face in 35-36% of cases (fig. 18).

16 How does your institution support teacher competence development in creativity?

![Survey Results]

Figure 18: How creativity is delivered

Compulsory online provision takes place only 7-8 percent in respondents’ organisations. It could of course also be an optional offer.

Fig. 19 shows that, while all areas are covered to come extent, Using ICT to enhance creativity is relatively well covered, as well as Providing opportunities for learners to experiment and take risks and Creating learning opportunities that support learners’ creative habits of mind.
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1.3.4.1 Competence training wishes

Finally, there was one open question (Q18) allowing for free text answers:

What competence training would you like to offer if budget, time or priorities allowed?

An impressive 38 percent (160 of the 415 respondents) made suggestions in response to this question.

Most (approximately 50 percent of responses) were related to the four topics, for example ‘courses that meet these objectives’ (AT). This suggests that, contrary to some of the responses to other questions, organisations need to provide more coverage of these competences, at least in the opinion of a significant proportion of respondents.

Other suggestions relate to the self-regulated learning aspect of Teach-UP, for example ‘professionals and teachers to have the ability to learn by themselves’ (LT)

Other topics mentioned by one or more people were:

- Statistics
- Personal development

Figure 19: Gaps in provision

Topics that more people considered to be less well covered in their organisation are:

- Collaborating with external professionals (42% under 20%)
- Creating learning environments that support creative habits (36%)
- Providing opportunities to experiment and take risks (34%)

Co-funded by the Erasmus+ Programme of the European Union
• Class management
• Learning to learn
• Language skills
• Diversity, service and compassion
• Personal and social skills
• Skills to deal with indiscipline and different children
• Skills to restructure the school organisation
• The holocaust as a tool for attitudinal education
• Geopolitics
• Emotional intelligence
• Science at CERN etc.
• Learn to listen
• Multiple intelligences
• Special educational needs
• Leadership, agents of change
• Conflict resolution
• Teacher as a member of an organisation
• Critical thinking
• Motivation to learn
• Managerial competences.

1.4 CONCLUSION

The main aim of the survey was to identify gaps in provision in the four competences. To some extent the results indicate that there are no areas that are not covered by the average institution, but that a proportion of respondents consider that these competences are not covered effectively. The open-ended question indicated that there is potentially strong interest in training in these four competence areas.

The topics that are relatively less covered, and therefore possible topics for Teach-UP training, are the following:

• Formative assessment
  o Using technology platforms that support student interaction and self- and peer-assessment (60 percent of respondents fall into this category)
  o Diagnosing sources of learner misunderstanding (44% of respondents)
  o Creating classroom cultures to encourage interaction and use of assessment tools (41% of respondents)

• Personalisation and differentiation
  o Creating collaborative partnerships within and beyond schools to support student learning (40% under 20%)
  o Knowledge of pedagogies appropriate for learners’ culture, socio-economic background and special education needs (36%)

• Collaboration
  o Monitoring and giving feedback to students on collaborative processes and outcomes (42% consider that it is covered only to an extent of up to 20 percent)
  o Developing a repertoire of structured activities (37%)
  o Supporting students’ use of collaboration technologies (37%)
• Creativity
  o Collaborating with external professionals (42% under 20%)
  o Creating learning environments that support creative habits (36%)
  o Providing opportunities to experiment and take risks (34%)

While differences between the four topics are quite small, it is in formative assessment that the greatest need seems to lie, particularly Using technology platforms that support student interaction and self- and peer-assessment and Diagnosing sources of learner misunderstanding (one of two topics explicitly featuring technology). There are also gaps related to bringing the outside world into the classroom and what could be termed ‘widening the learning offer’, for example developing repertoires of activities, providing opportunities to experiment, and knowledge of pedagogies appropriate to the individual learner. ‘Self-knowledge’ is a further area where additional training could be offered, related to the gap in monitoring and giving feedback, diagnosing misunderstanding and self- and peer-assessment.

The results of the survey show that little compulsory online training takes place at present. There are likely to be national differences as regards gaps in provision, to be explored in ‘country dialogue labs’, supported by further analysis of this dataset.
The Teach-UP policy experiment is constructed around some of the key skills needed by the teacher of tomorrow: applying formative assessment, nurturing creativity, fostering collaboration and personalising learning. Four online courses will be developed to develop competences in these four areas:

- **Formative assessment**: monitoring student learning by helping students to identify their strengths and weaknesses and target areas that need work immediately.
- **Creativity**: imagination, thinking and production.
- **Collaboration**: interpersonal competence (understanding and learning from different points of view), adapting and to problem solving, organisational planning, diagnosing and responding to school-wide needs.
- **Personalised learning**: instructional approaches, and support strategies to address the distinct learning needs, interests, aspirations and cultural backgrounds of individual students.

This section provides a short paper on current research in each of these four areas, intended to underpin subsequent work on the courses with concrete evidence from research. Each study begins with a definition of the topic, followed by evidence for its impact on teaching and learning, how it can effectively be integrated into classroom practice, and how teachers’ skills in applying the approach can be developed.

The authors of the reviews are Janet Looney, EIESP (Formative assessment and Creativity) and Katja Engelhardt, European Schoolnet (Collaboration and Personalisation).
2.1 FORMATIVE ASSESSMENT
Janet Looney, EIESP

2.1.1 What is formative assessment?
Formative assessment is not one specific practice, but rather an approach to teaching and learning. It may be best seen as a conceptual approach – a dynamic process which teachers adapt according to conditions and needs (Clark, 2010).

Black and Wiliam’s definition, which is perhaps the most widely cited in this field, emphasizes formative assessment as a process (Black and Wiliam, 2001):

“Those activities undertaken by the teacher, and by their students in assessing themselves (that is, students’ assessment of their own work as well as their peers), which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. Such assessment becomes ‘formative assessment’ when the evidence is actually used to adapt the teaching work to meet the needs.”

Clark (2010) adds to this, suggesting that feedback is formative not only when teachers adjust strategies, but also when students:

- are engaged in a process that focuses on meta-cognitive strategies that can be generalised …
- are supported in their efforts to think about their own thinking
- understand the relationship between their previous performance, their current understanding and clearly defined success criteria
- are positioned as the agent improving and initiating their own learning.”

In their discussion on the French tradition of formative assessment, Allal and Mottier Lopez (2005) also highlight formative assessment as a process embedded in teaching and learning:

Formative assessment is integrated in each instructional activity (rather than a discrete event on completion of a phase of teaching)

For Allal and Mottier-Lopez, formative assessment includes classroom interactions, questioning, structured activities, and feedback aimed at helping students to close learning gaps.

The OECD (2005) synthesised different approaches to formative assessment based on international research (including the authors cited above) and observations of classroom practices across several OECD countries, and suggested a framework encompassing:

1. Establishment of learning goals, and tracking of individual student progress toward those goals.
2. Use of varied approaches to assessing student understanding
3. Feedback on student performance and adaptation of instruction to meet identified needs.
4. Active involvement of students in the learning process.
5. Use of varied instruction methods to meet diverse student needs.
6. Establishment of a classroom culture that encourages interaction and the use of assessment tools.
It should also be noted that since the 2005 publication of the OECD report, a number of
digital tools have been also been developed to support formative assessment, enabling
teachers and students to track progress and identify patterns in learning, providing platforms
for peer interaction, and adapting online learning and feedback to needs. Some key
developments in new technologies to support formative assessment are discussed below.

2.1.2 What is the evidence of the impact of formative assessment?

In their seminal review of the research on classroom-based formative assessment, Black and
Wiliam (1998) studied the impact of a variety of approaches techniques to support student
learning. Their review draws on 250 international sources, covering learners ranging pre-
school to university. As they noted, the boundaries of the research were loosely drawn
because “…the term formative assessment does not have a tightly defined and widely
accepted meaning.” (Black and Wiliam, 1998, p. 1). They included studies on effective
feedback; questioning; comprehensive approaches to teaching and learning featuring
formative assessment, such as mastery learning (in which, the concept of student formative
assessment has its origins); and, student self- and peer-assessment. From these 250 studies,
evidence of impact was drawn from more than 40 studies that were conducted under
ecologically valid circumstances (that is, controlled experiments conducted in the student’s usual
classroom setting and with their usual teacher). Based on this, Black and Wiliam concluded that
“…formative assessment does improve learning. The gains in achievement appear to be quite
considerable…and among the largest ever reported for educational interventions”.

Other researchers have also found strong learning gains for formative assessment. Hattie
(2017) has developed a substantial database of meta-analyses on a range of educational
interventions, and provides estimates of their effect sizes. Effect sizes for selected
interventions which may be considered as formative are significant:

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom Discussion</td>
<td>0.82</td>
</tr>
<tr>
<td>Feedback</td>
<td>0.73</td>
</tr>
<tr>
<td>Formative Evaluation</td>
<td>0.68</td>
</tr>
</tbody>
</table>

(Hattie’s full list of effect sizes for educational interventions was initially developed in 2009
and updated in 2011 and 2015. The data above are from 2015. Hattie’s full list may be
found here: https://visible-learning.org/nvd3/visualize/hattie-ranking-interactive-2009-
2011-2015.html)

These effect sizes are of course based on small-scale interventions. The effectiveness of
formative assessment practices, as Bennett (2011) emphases in his critical review of the
literature, will ultimately depend on classroom conditions, and impact may vary from one
implementation to the next.

2.1.3 Integrating formative assessment in classroom practice

Below, we set out key evidence of effective approaches. Some of these classroom strategies
are relatively easy to implement and others require careful planning and deep understanding
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of how learners construct knowledge in different domains and at different stages of development.

2.1.3.1 Setting clear learning goals and criteria and tracking student progress
Formative assessment is a criterion-referenced approach to measurement of learning. In other words, the expected learning outcomes and the criteria for assessment are clearly defined and students are aware of these expectations. Teachers (or the students themselves) identify the “gap” between the expected outcome and what students know and are able to do, and adjust teaching to help close the gap. This transparency may also support student self- and peer-assessment. In some cases, teachers may co-construct learning goals (within the defined curriculum) and criteria for assessment with students.

Crossouard and Pryor (2012) argue for a more radical approach to formative assessment to allow for more exploratory approaches to learning where learning outcomes are not already defined, and which provides room for “contingencies” and meaning-making in classrooms. In this approach, the ability to manage classroom dialogue, to follow meaningful opportunities for contingent learning, and to support independent and collective student work are vital (see below).

2.1.3.2 Providing feedback
A number of studies have focused on feedback that best supports learning. For example, several studies have shown that feedback is most effective when it is timely, is tied to criteria regarding expectations, and includes specific suggestions for how to improve future performance and meet learning goals. Scaffolding -- that is, providing as much or as little information as students need to improve their work, or thoughtful questioning that serves as a prompt for student reflection -- is also vital.

2.1.3.3 Classroom dialogue and questioning, engagement in activities
A number of researchers have noted that the quality of formative assessment depends in part, on teachers' strategies to draw out evidence of what students know and are able to do (Bell & Cowie, 2001; Heritage, 2010; Herman et al., 2010).

Classroom dialogue and questioning and engagement in activities are central to this. Effective classroom questioning:

- Avoids yes/no questions
- Is based on empirical evidence of how students construct knowledge in a given domain. Questions should allow identification of student misconceptions in the domain.
- Focuses on problem-solving and reasoning processes, rather than specific content. For example, “how” and “why” questions may yield more information.
- Differentiates between levels of performance in the domain (from novice to highly competent) based on central concepts students must understand. Criteria are adjusted for different levels of learning and different learning goals.
- Allows students to generate their own lines of questioning as a way to deepen and extend their understanding.

(Chudowsky and Pellegrino, 2003; OECD, 2005; Williams and Ryan, 2000)

Through extended dialogues and activities, teachers may also monitor a range of student
performances and analyse patterns that reveal specific misconceptions or gaps in learning. Crossouard and Pryor (2012) suggest that dialogic engagement with students may also support deeper and more exploratory learning.

Teachers need deep knowledge of the domain as well as learning to structure effective dialogues. Interaction and engagement in structured dialogues and/or activities also allow teacher to gain insight into student thinking. Activities may involve observation, review of written work products and portfolios, student presentations, tests and quizzes (Shepard, 2006). These varied views on student work over time and in different contexts allow teachers to identify patterns in thinking and problem solving.

- **Timeliness** – Feedback is most effective when it is provided in the course of a conversation, within a few minutes of an interaction, or at the most, within a period of days (Shavelson et al., 2008). At the same time, it is important to allow students time to reflect (OECD, 2005). Wiliam and colleagues (2004) have found that in classrooms where teachers provided formative feedback within or between teaching units, students in the control classroom progress at approximately double the rate of their peers.

- **Specificity** – Feedback that is clearly tied to criteria of expectations, and which includes specific suggestions for how to improve future performance and meet learning goals has been found to be more effective. Vague comments such as “needs more work” may have a negative impact on learning (Boulet et al., 1990; Butler, 1988). Other research highlights the importance of focusing on the learning process rather than on the final product. Mischo and Rheinberg (1995) and Köller (2001) found that tracking progress has a positive effect on students’ intrinsic motivation, self-efficacy, performance, and attribution of progress as due to effort rather than ability.

- **Task- rather than ego-oriented** – Ego-oriented feedback, even when expressed as praise, may have a negative impact. On the other hand, feedback which focuses on the task at hand and what the student may do to improve his or her work has a positive impact.

2.1.3.4 **Classroom cultures**

Classroom cultures encompass the relationships between and among students and teachers. A number of researchers have noted that effective practice of formative assessment is based on a philosophy of learning and learners. For example, formative assessment approaches align with the view that learning is more the result of effort (what Dweck (2006) calls a “growth” mindset) than talent are aligned with formative assessment. Student self-efficacy – that is, an understanding of what steps are needed to succeed at a task – is also vital.

Positive relationships between and among students and teachers are also important. If students are to reveal what they do and do not understand, they need to feel safe to take risks and make mistakes in front of the teacher as well as peers.

2.1.3.5 **Peer and self-assessment**

A fundamental goal for formative assessment is to help students develop skills for self- and peer assessment (Sadler, 1989) to track the processes they use as well as their progress toward learning goals. Clark (2012) argues that self- and collective efficacy, feedback, and classroom environments, relationships and social norms create the conditions for the
development of student self-regulated learning (i.e. the acquisition of effective study habits).

Clark (2010) highlights the importance of high-quality interactions not only among students and teachers, but also parents and carers. He suggests that students need to:

- be fully involved in deciding on next steps for learning;
- be aware of who can give them help, if needed, including parents and carers;
- develop their own metacognitive processes;
- take more responsibility for their learning

These aspects may be supported by more frequent opportunities for open learning, in line with Crossouard and Pryor’s (2012) suggestion that learning should move beyond what students are “supposed to learn” to allow freedom to explore complex problems without mediation of the curriculum.

### 2.1.3.6 Adapting teaching

For Black and William (2001), assessment is not considered as formative until evidence of student learning is actually used to adapt the teaching work to meet the needs. Teachers need a repertoire of methods to identify what students already know and are able to do, and to build on that, or to diagnose the source of misunderstandings or learning gap, and meet varied student needs. Clark (2010) suggests that it the teacher’s ability to adapt teaching to meet needs in practical settings that is fundamental to furthering student learning.

Classroom interactions provide opportunities to explore learning that cannot be gathered through large-scale summative assessments. Rupp and Lesaux (2006) have found that large-scale assessments may mask heterogeneity in causes for poor performance. Assessments that allow greater diagnostic precision allow teachers to develop appropriate instructional interventions.

It is also important to note that approaches to teaching, learning and assessment need to be adapted to the domain being studied. This includes understanding novice performance and typical learner misconceptions in the subject, the development of effective learning environments, supporting students’ self-regulated learning (Bransford et al., 1999; Pellegrino et al., 1999), and analysis of patterns in student responses (Harlen and James, 1997; Williams and Ryan, 2000).

### 2.1.3.7 Integrating Tools: Digital and Analogue

Tools to support classroom-based formative assessment have typically included analog rubrics setting out “criteria for learning and gradations of quality (Andrade, 2014), and monitoring tools to track learning over time. The “stoplight” technique, that is flashcards with red, yellow, green which allow students to quickly indicate that they don’t understand (red), are not quite sure if they’ve understood (yellow), or that they do understand (green) a new concept is a very basic tool that allows teachers to gauge whether to move on with a lesson, or how to group students to support each other’s learning.

Recently, significant attention and resources have been devoted to the development of digital tools to facilitate formative assessment in classrooms or for independent student learning. These include:

- Massive Open Online Courses (MOOCs)
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- Serious games and gamification
- Digital clickers (allowing students to indicate understanding during the course of a discussion)
- E-portfolios
- Technology-enhanced problem based learning incorporating scenarios, cases, videos, 3-D imaging, face-to-face student collaboration, concept mapping tools, and links to online open educational resources.
- Learning analytics

(Spector, J.M. et al., 2016)

A variety of advantages are attributed to these new technologies. For example, large data sets may be used to identify learning patterns and potential teaching interventions to address learning gaps (a learning analytic approach) (Ellis, 2013; Bull et al., 2014; and Colvin et al., 2015).

- Spector et al. (2016) point to promising developments in online learning and assessment that move beyond basic scaffolding of learning. For example, they describe the Highly Integrated Model Assessment Tools and Technology (HIMATT) programme which provides learners with problem situations and them prompts them to indicate relationships involved in addressing the problem. This problem conceptualisation is then compared to how an expert would approach the problem, or uses reference models, and indicates areas for the learner’s further consideration (Ifenthaler, 2010; Pirnay-Dummer, Ifenthaler, & Spector 2010; Spector & Koszalka, 2004 – cited in Spector et al., 2016). However, Spector et al. also note that further research and development will be needed for teachers to develop their own complex problems and reference models using this platform.

- Two other examples cited by Spector et al. are MathSpace and Smart Sparrow. MathSpace enables recognition of hand writing for mathematics problems and allows learners to address different mathematical questions and receive immediate feedback at each stage (Alao, Lee, O’Kane, & Jackson, G, 2016 cited in Spector et al.). Smart Sparrow provides real-time mapping and sequencing of learning to match the sequencing of instruction to different learner characteristics (Spector, et al., 2016),

- Lin and Lai (2013) describe an experimental approach to collaborative annotation of historical records online – supporting peer learning and allowing teachers to manage the learning process and identify learning gaps of the class more efficiently. Lin and Lai found that this approach enhanced learning and retention, and also supported student motivation.

These selected examples highlight technology to enhance teaching and formative assessment. They allow teachers and students to monitor student thinking more closely, and to adapt instruction. Students may also track their own learning and engage with peers more frequently. The teacher remains central to this process, but digital tools allow an effective way to monitor learning of all students in a class in real-time.

Sadler (1989) argued that for students to be able to improve they must develop the capacity to monitor the quality of their own work by learning to appreciate high quality work along with the knowledge and skills to be able to compare their work against high quality work (i.e., effective self-assessment). Self-assessment can foster and strengthen meta-cognition and self-
regulation skills that are important learning skills (Bransford, et al., 1999).” Spector, J.M. et al. (2016).

2.1.4 How can teachers develop their formative assessment skills?

Some formative assessment approaches can be easily integrated in classroom teaching – including more timely as well as more specific and task-oriented feedback. Engaging learners in conversations on learning goals and criteria is also easily integrated in teaching. Digital tools may also support teachers as they monitor student learning.

It may take time for teachers to shift from transmission styles of teaching to more interactive and dynamic engagement with students. Deep questioning and structured classroom dialogues require strong subject-matter knowledge as well as of cognition, and how learners structure knowledge. Engaging students in meaning-making that is free of defined curricular goals may also entail a dramatic shift.

Teachers may need to work with their peers to develop effective questions, to reflect on their efforts to integrate formative assessment, and to rethink the manner in which they engage with students. Teacher team work can support this type of reflection, as well as sharing of experiences and ideas about how to address particular teaching challenges.

2.1.5 References


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2.2 NURTURING CREATIVITY

Janet Looney, EIESP

2.2.1 What is creativity and can it be taught?

Creativity is a key theme in education for 21st century learning. It is believed that creativity will prepare learners to address rapid social, economic, environmental, and technological changes (OECD, undated). Martha Nussbaum (2011) argues that human dignity and progress are rooted in each individual’s capabilities, including those that are central to creativity: being able to use the senses, imagine, think, and reason, and to have the educational opportunities necessary to realise these capabilities.

Yet creativity is not well defined in education policies. There is little guidance on how to integrate approaches to nurturing learner creativity in teaching and assessment or on the impact of different approaches on learners’ creative capacities (Cachia et al., 2010; Craft, 2001; Ryhammer & Brolin, 1999).

In the following pages, we provide an overview of state of the art on research on creativity in education. Researchers working in this field are engaged in ongoing debates on the nature of creativity and how to define it, how to identify creative individuals, and how to assess the quality of creative processes and products. This research touches on creativity in every domain, and not just the arts. Following this overview, we then explore research on effective approaches to nurturing creativity in classrooms.

2.2.2 Defining the contours of the field

2.2.2.1 Who is creative?

To answer the question “who is creative”, researchers have distinguished between big “C” little “c” creativity. The Big “C” designation refers to the creative genius, while little “c” refers to everyday creativity of which everyone is capable.

The early research on creativity was focused on identifying learners with high creative potential – the big “C” aspect. It was assumed that creativity was a fixed trait and hoped that it could be assessed at an early age so that exceptional talent could be identified and nurtured. The widely-used Torrance Tests of Creativity and Divergent Thinking (1966, 1974) and tests developed by Guilford (1950, 1967, 1973), for example, measured “divergent thinking” and “ideational fluency” — i.e. how many different and novel solutions a learner could generate to address a given problem — to identify a learner’s potential.

A number of commentators have criticised these early approaches to testing for creativity, arguing that the number of ideas a person generates and how unique or uncommon they are do not mean that they are of value or useful (Cattell & Butcher, 1968; Runco, 2001). The most creative people seem to be those who are able to arrive at the ‘best’ solution in the shortest period or with the greatest simplicity.
Researchers still consider that personal traits, or dispositions, are correlated with creativity. But it is also believed that all individuals can develop capacity for everyday creativity (i.e., small “c” creativity), including divergent thinking and the ability to generate new ideas or develop skills for creative problem solving over time (Runco & Albert, 1986).

In their review of the literature on creativity, Spencer, Lucas and Claxton (2013) identify five dispositions (or “habits of mind”) of creative individuals, which may be developed over time. Creative individuals are:

- **Inquisitive.** Inquisitiveness involves wondering and questioning, exploring and investigation, and challenging assumptions.
- **Persistent.** Individuals who are persistent tolerate uncertainty, are able to “stick with” tasks in spite of difficulty, and dare to be different.
- **Imaginative.** Imagination involves playing with possibilities, making connections, and using intuition.
- **Collaborative.** Individuals who are collaborative are able to cooperate appropriately, to give and receive feedback, and to share the product.
- **Disciplined.** In the context of creativity, discipline involves critical reflection, developing techniques and crafting and improvement.

Other researchers have identified characteristics of creative individuals as including:

- Cognitive and affective variables such as effort and persistence (Grant & Dweck, 2003), the ability to generate a variety of ideas (Atchley, Keeney & Burgess, 1999; Guilford, 1967; Torrance, 1966, 1972), to question and to reflect critically, and to synthesise ideas from diverse sources (Sternberg & Kaufman, 2010).
- Creative self-efficacy — i.e. belief in one’s capacity to address challenges and to persist, as well as willingness to take intellectual risks — are particularly important (Bandura, 1997). Intrinsic motivation, engagement and intense focus — what Csikszentmihalyi (1990) has described as ‘flow’ — are also important.
- Active participation in social networks, which has been identified as important to enhance creative potential in studies drawing on educational data mining techniques and self-reported creativity scores (Dawson, Tan & McWilliam, 2011).

### 2.2.2.2 What processes support creative work?

Research on creative processes overlaps to some extent with research on creative dispositions. But it is also concerned with identifying specific behaviours of creative individuals (e.g. exploratory behaviours, analysis, evaluation, synthesis) and approaches to problem finding and problem solving in different domains and at different stages of development.

Hargrove (2013) argues that metacognitive thinking — that is, thinking about one’s thought processes — is what separates “truly creative thinking” from a novice approach. Learners who are actively engaged in building knowledge and regulating cognition are able to develop conditional, declarative and procedural knowledge that can support adaptation and combination of existing creative strategies or development of new strategies.
Other researchers have focused on the importance of an incubation period for problem solving. For example, Sio and Ormerod (2009), in a meta-analysis of empirical studies found that incubation was crucial for fostering insight. They suggest that this incubation time allows for identification of as many relevant connections as possible as well as of multiple solutions. With time, the learner may re-approach the problem and consider previously unexplored areas of knowledge.

Disequilibrium may also spur creative processes. For example, Timperley and colleagues (2007) found that significant problems or new information that challenges an individual’s previous conceptions is most likely to spur creative processes. This requires thinking in new ways and making new connections with prior knowledge and beliefs. Individuals also need to develop the capacity to tolerate ambiguity and frustration (Albert, 1996).

2.2.2.2.1 Nurturing creativity in classrooms

Creative classrooms are student-centred, and as expressed by the popular maxim, teachers take on the role of ‘guide by the side’ rather than ‘sage on the stage’. But teachers also have a key role in appropriately structuring learning opportunities to spur student learning and in nurturing the “habits of mind” that support creativity. Learners themselves may be involved in tracking the development of these dispositions.

2.2.2.2.2 Structuring knowledge

Creativity in any given domain entails deep knowledge and the capacity to access and structure that knowledge (Feldhusen & Goh, 1995). Classroom dialogue and questioning also have an important impact on whether and how learners make connections between ideas and develop new insights. Scaffolding — i.e. setting challenges for learners at the right level and providing as much or as little information and guidance as needed — can support learners as they move from novice to more expert levels of performance (Allal, 1999).

There is an ongoing and fundamental debate as to whether creativity involves domain-general or domain-specific knowledge and skills or a mix of both. In other words, do creativity and the capacity to structure knowledge in one area (such as music) transfer to another (such as mathematics) or even within sub-domains (such as between poetry and short-story writing)? Baer and Kaufman (2005) suggest the need for a theory that encompasses both domain-specific and domain-general approaches, and empirical research on the most effective approaches within and across domains (see also Lubart & Guignard, 2004; Plucker & Beghetto, 2004).

The idea of transfer from one domain to another is also explored in an OECD review of the literature related to the impact of arts education on learning (Winner, Goldstein and Vincent-Lancrin, 2013). The authors did not find support for the claim that arts education improves verbal and mathematical performance or that it enhances innovative thinking. They also stress that there is a need for more experimental studies where causality can be established before any firm conclusions can be reached.

2.2.2.2.3 The importance of exploration for creativity

Moreau and Engeset (2016) describe a study using LEGO kits on to understand the impact different types of play on problem-solving ability. In recent years, LEGO has shifted from boxes with loose bricks and pieces to themed kits. The two types of kits allowed researchers to contrast ill-defined vs. well-defined problem solving play. They found the themed kits, which
set out well-defined problems can diminish subsequent performance on creative tasks. While motivation to be creative remains constant, the well-structured tasks reduced levels of divergent thinking necessary when working with ill-defined problems.

On the other hand, other research has shown that educational interventions can support creativity. Kwon, Lee and Lee (2016), in their synthesis of 37 studies on “invention education” in pre-school through upper secondary schools in South Korea found that invention programmes help to improve student creativity, attitudes toward science and tendency for technological problem solving (with their meta-analysis of studies showing medium effect size of 0.694).

Other research has shown that the classroom and home environments, as well as the broader and social and cultural context, have a clear impact on creativity. Amabile (1990) noted that individuals were more creative in environments that encouraged exploration and independent work and that valued originality — in other words, in settings that encourage open learning. In turn, teachers are also more likely to focus on learner creativity and teaching creatively in school and policy environments that value and support them and encourage innovation and associated risks, and that allow them to develop their own creative dispositions. Giaconia and Hedges (1982) have also found that open education, where learning goals are not pre-determined supports learners’ self-concept, creativity and positive attitudes toward school.

2.2.2.2.4 Metacognition and creativity
Jausovec (1994) developed a series of studies to understand the influence of metacognition on creative problem solving. Metacognition was found to be particularly important for solving open-ended problems. More proficient learners had a better understanding of general cognitive strategies — how and when to apply them — than those who were less proficient. They were also more likely to use “self-checking” and monitoring strategies. The less proficient group were also more likely to use rigid approaches to finding solutions.

Hargrove (2013) studied the long-term impact of instructional interventions to support metacognition for design students. Learners were encouraged to reflect on when, where and why they made use of specific thinking strategies or cognitive approaches, and then trace the success or failure of a decision to a specific thinking process. Hargrove found students participating in instructional interventions demonstrated significantly higher levels of creative thinking over the four years of their study.

2.2.2.2.5 The creative dispositions
A range of studies explore teaching to nurture the dispositions, or habits of mind that are important for creativity. For example, there is a growing body of literature on the importance of persistence for achievement. Duckworth and Seligman’s (2005) work on self-discipline (which she also refers to as “grit”) is perhaps the most well-known work in this area. They found that self-discipline as measured through a behavioural delay-of-gratification task, a questionnaire on study habits, and a group-administered IQ test, out-predicted IQ for academic success by a factor of two. These findings are also relevant for creativity.

Other research supports the idea that learners can develop their capacity for self-discipline, persistence and other positive dispositions. Dweck (2006) has found that individuals with a “growth mindset” (in other words the belief that effort is more important than talent) were more likely to succeed over time than those with a “fixed mindset”. Dweck and colleagues tested this proposition with hundreds of adolescent learners. The learners were all given a
baseline nonverbal IQ test. Following the test, some were praised for their ability and others were praised for their effort. The researchers found that the learners who were praised for ability, when given a choice, were less interested in participating in more challenging tasks. By contrast, 90% of learners who had been praised for effort preferred the more challenging task.

2.2.3 Digital tools to support creativity

Digital tools are used more and more frequently to facilitate learning. They may involve online blogs, peer review, social media, filmmaking, or collaborative problem solving. In spite of the popularity of these different tools, research on the use of digital tools to support creativity is scarce.

In one example, Kim et al. (2016) studied the use of a range of interactive technologies in English classes in a high-tech lower secondary school in Korea. The technologies included tablets, electronic blackboards and interactive management software. The instructional model was conceptualised as “visual thinking through tablet-based classroom interaction”. Learners were able to communicate their ideas through drawing, presentations and in discussions. At the end of semester, the researchers used the Torrance Tests of Creative Thinking-Figural form to assess learner creativity in six treatment classes and in six control group classes. The researchers found that students in the treatment group scored significantly higher on originality, abstractness of titles, elaboration subscales and overall creativity.

The “Hole-in-the Wall” experiment in rural India, which has been the subject of international attention, is an example of digital tools and informal learning. In this experiment, an unsupervised playground computer kiosk was created. Groups of children exposed to these kiosks learned to use the computers on their own, without adult supervision (Mitra and Rana, 2001). This experiment was not so much about the use of tools to directly facilitate creativity as it was about way in which children, either individually or collaboratively, focused their problem-solving skills on understanding how to use the computer. A subsequent study by Indamar and Kulkarni (2007) examined the downstream impact of this experiment. They followed students over a 2.5 year period (2002 – 2004) in kiosk school and a non-kiosk school, and frequent and infrequent users of the kiosk. The study included a total of 161 students who in 2004 were aged 13-14. The researchers assessed differences in intelligence, creativity potential, leadership potential, and correlated these with frequency of kiosk use. The school results show a significant impact of kiosk usage on mathematics performance, including creative problem solving.

While these two studies show the promise of technology to support exploration and learning, Jaron Lanier (2011), who is known as the father of virtual reality, has observed that different digital architecture stimulates different potentials. While some platforms may support more creative processes, others are based a rigid design and may restrict creativity.

Studies of digital tools to support creativity are very limited, but they nevertheless provide food for thought regarding possibilities and limits. More research is needed on the effective classroom use of digital tools, as well as on how of informal use of digital tools outside of school effects creativity.
2.2.4 Assessing creativity

There has been insufficient attention to assessment of learners’ creative processes and products. This may be in part because there is no widely shared definition of creativity in education policy or in school curricula (Cachia et al., 2010). Teachers may resist any traditional assessment of learners’ creative work (Fryer, 1996; Lucas et al., 2013). This may also reflect teachers’ desire to avoid discouraging learners’ self-expression.

Nevertheless, there are a few tools to assess creative products. For example, the Consensual Assessment Technique, or CAT (Amabile, 1979, 1983) sets out processes for expert and novice judges to rate product creativity in different domains. This approach is appropriate for summative assessments, particularly when the reliability of judgments is crucial (“reliability” means that the assessment could be repeated and produce consistent ratings). Similar assessments of creative work include the Creative Product Semantic Scale (Besemer, 1998; Besemer & O’Quin, 1999, cited in Plucker & Makel, 2010) and the Student Product Assessment Form (Reis & Renzulli, 1991).

Among experts on creativity, there is fairly wide agreement that creative work — whether of the big “C or small “c” variety — is novel, appropriate to the task at hand, and of high quality as compared to some reference groups. In the arts, creativity may be found in something that is both original and aesthetically pleasing (Sternberg, Kaufman & Pretz, 2002).

Lin et al. (2016) developed a study of 53 sixth year students who engaged in Web 2.0 story telling activity. The online platform incorporated peer review based on rubrics setting out criteria for judging the level of sophistication in the stories, including content and structure. The researchers found that those students who participated in peer review produced significantly more sophisticated stories that those in the control group. They also found that the experimental group’s creative self-efficacy consistently reflected their creative performance after having participated in peer review. Liu et al. (2016) hypothesise that social assessment activities support a better alignment of self-efficacy with actual performance. They also suggest that teachers may need to support learners as they develop their skills for assessment, for example, through in-class presentations of creative work and opportunities for learners to discuss and comment on others’ work, or through structured peer review activities.

Assessment of the creative dispositions may also support and reinforce learning for creativity. Lucas, Spencer and Claxton (2013) developed an assessment tool which distills the research on creative dispositions. The tool, which was validated by teachers and learners in two field trials in 12 schools, is based on the five essential habits of mind (inquisitiveness, persistence, imagination, collaboration and discipline), and for each of these, three sub-dispositions (Figure 20). It allows teachers and learners to track the strength, breadth and depth of development in each area (Lucas et al., 2013). It thus supports metacognition on development of dispositions over time.
In conclusion, while creativity in education has been a subject of interest for some time, the empirical research on the impact of different approaches to nurturing creativity is still at an early stage of development. Teachers can contribute to through action research on what works, for whom, and under what conditions.

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2.3 COLLABORATIVE LEARNING
Katja Engelhardt, European Schoolnet

2.3.1 Introduction

Research shows that students are motivated when they feel in control of their learning, when they learn something that is relevant to their own lives, and learn when connected with others (Biggs, 1995; McCombs, 1994; cited in Gómez, 2016). Personalized and collaborative learning approaches both aim to provide students with such learning experiences. Moreover, both approaches have the potential to foster 21st century skills such as independent learning, collaborative problem-solving, critical thinking and deeper learning (Gijsbers and van Schoonhoven, 2012; Leadbeater, 2008; Learnovation, 2009; Redecker and Punie, 2013; cited in Scott, 2015).

For their potential benefits, both approaches have recently received interest from research and practitioners. Advocates and early adopters of personalized learning, for instance, view it as a ‘game changer’ with the potential to accelerate learning for students dramatically (Hyslop & Mead, 2015). This year (2017), the OECD will publish its first country rankings for collaborative problem solving. The OECD has recognized already for some time that these subtler skills are becoming more important; national policymakers are likely to follow (Luckin, Baines, Cukurova, et. al., 2017). Others are more sceptical, viewing collaborative approaches as a potential “distraction from the more traditional transmission of knowledge” (Luckin, Baines, Cukurova, et. al., 2017) or personalized learning as an approach associated with excessive screen time that harms children, developers that will abuse student data and vendors simply trying to make profit of public schools (Hyslop & Mead, 2015). Some of that scepticism might stem from the fact that both new learning approaches challenge traditional teaching where the teacher stands in front of the class to transmit their knowledge. Interestingly, Burns, Pierson & Reddy, 2014) highlighted that when teachers see positive changes as a result of their actions their deeply-held beliefs about traditional instruction may sometimes also conflict with what they in fact witnessed in their classroom: “This is the beginning of the evolution of change.”

However, even though collaborative and personalized learning approaches are both innovative, the ideas behind both are not entirely new. For instance, the practice of using small-group activity structures has a long history in the field of education (e.g., Evans, 1942; Shields, 1927; cited in Puzio & Colby, 2013). However, two factors have reinforced interest in such innovative teaching approaches: First, schools face the challenge of how to equip students with new 21st century skills to thrive in today’s digital society and changing employment markets. Second, technology enables students to access more information in different ways, to communicate and collaborate more effectively with others from distance, and the teacher to collect more data about students’ learning.

Finally, both approaches also share similarities in the way they are implemented. Both aim to put the student at the centre of learning, by organizing the learning so that “it means something to the learner” (Leadbeater, 2008; cited in Scott, 2015) and students “become much
more directly immersed in the ideas of the class” (Smith & MacGregor, 1992; cited in Scott, 2015). Subsequently, both approaches aim to shift more responsibility to the learner, which also leads to a change in the role of the teacher, moving towards that of a facilitator. Ultimately this shift requires the redefinition of teacher and student agency, or more concretely, a discussion on how much the teacher should still structure learning and how much freedom students have to take their own decisions on their learning. There is also personalization within collaborative learning (Leadbeater, 2008; cited in Scott, 2015).

2.3.2 Defining collaborative learning

Collaborative learning can be defined as follows:

Collaborative problem solving among students involves joint recognition and understanding the nature of a problem; communication, negotiation and exchange towards a plan to address the problem; coordinated action to carry out the plan, monitoring of progress; and, if necessary, adaptation of the strategy (adapted from Griffin & Care, 2014).

In contrast to traditional lecture-based learning, collaborative learning is a form of learner interaction developed through an interactive, group knowledge-building process (Scott, 2015). The assumption that people make meaning together and that the process enriches and enlarges them lies at the centre of this approach (Matthews, 1996; cited in Davidson & Major, 2014). Collaborative learning is only one group-based learning approach amongst others, such as problem-based learning and cooperative learning. Even though the terms are used interchangeably at times, they refer to three distinct approaches that have developed separately. Each has characteristics it may share with one or both of the other approaches; but all three have differences as well. Common features of all three approaches are: a common task or learning activity suitable for group work, small-group interaction on the learning activity, cooperative, mutually helpful behaviour among students as they strive together to accomplish the learning task, individual accountability and responsibility and interdependence in working together (Davidson & Major, 2014). As also illustrated in the concept map below, cooperative learning is typically viewed as more structured, more prescriptive and more directive about how students work together (e.g. participation roles) than the two other approaches (Puzio & Colby, 2013).
2.3.3 Impact of collaborative learning

Collaborative learning places students at the centre of learning: “Ideally, collaborative learning leads students to become much more directly immersed in the ideas of the class” (Smith & MacGregor, 1992; cited in Scott, 2015). What is so appealing about collaborative learning approaches is that they enable students to construct knowledge themselves and with others (Jonassen 1999; Van Boxtel et al. 2000, cited in: Janssen, Erkens, Kirschner et. al. 2010, (Hatami, 2015)). This approach encourages students no longer to perceive the teacher as the only source of knowledge and information (Slavin, 1991; cited in: Hatami, 2015). Students can become potentially responsible for each other’s learning as well as their own learning. In that case, they feel responsible for teaching their peers and managing questions and clarifications (Srinivas, 2011; cited in Scott, 2015) and are encouraged to monitor each other, detect errors and learn how to correct their mistakes (Laal et al., 2013; Trilling and Fadel, 2009); cited in: Scott, 2015). This interpersonal and interactive nature of groups has the potential to make learning more engaging for students (Scott, 2015), (Davidson & Major, 2014) and to give students a sense of control over what they are learning (academic benefits) (Kozma & Anderson, 2002, Panitz, 2004; cited in: García-Valcárcel, Basilotta, & López Salamanca, 2014).

The principal advantages of collaborative learning go well beyond engaging students in their own learning and are related to developing transversal skills that stimulate social skills, problem solving, self-reliance, responsibility, and the capacity for reflection and initiative (García-Valcárcel, Basilotta & López Salamanca, 2014). Students can benefit from group interactions through exposure to differing points of view and diverse backgrounds. They are encouraged not only to defend their ideas, to articulate their positions and to assimilate, process and synthesize ideas but also to engage one other by supplementing and revising existing knowledge (García-Valcárcel, Basilotta & López Salamanca, 2014). Teachers observed during the Active Learning in Maths and Science programme (described below) that certain students ‘stood out’ as knowledgeable during the work in small groups in ways they did not in the whole-class setting. Based on that observation, they explicitly encouraged peer instruction (explicitly tasking students to teach one another) and peer assessment (explicitly
tasking students to question one another’s assumptions and beliefs) (Burns, Pierson & Reddy, 2014).

Further, students can practise social and leadership skills in collaborative situations and gain experience in conflict resolution and collective learning (García-Valcárcel, Basilotta & López Salamanca, 2014). Collaborative learning can support individuals in adapting their learning to new problems and contexts. Learning such skills prepares students for real-life social and employment situations (Scott, 2015). Even more, it also favours self-criticism, self-evaluation and self-reflection (Jaques & Salmon, 2007; cited in University of Minho, 2013). Finally, a growing body of research shows that collaborative approaches support deeper learning (Barron and Darling-Hammond 2008, cited in Scott: 2015) and increases student achievement (Lou et al. 2001, cited in Puzio & Colby, 2013; Hatami, 2015, Scott, 2015, Gómez, 2016).

2.3.4 Elements of effective collaborative learning

2.3.4.1 Enabling co-creation of learning
As discussed in the previous paragraphs, collaborative learning has numerous potential benefits. However, in order to unlock this potential, collaborative learning needs to be implemented effectively. Appearances can be deceptive; even when students are put together in groups, giving the appearance of working together, there may be in reality few opportunities to actively collaborate in ways that are cognitively enhancing. It is crucial to create maximum opportunities for learners and teachers to talk, meet, ask questions, share information and exchange ideas (Vockley and P21, 2007; cited in: Scott, 2015). However, the goal is not just to create opportunities for interaction, but for co-creation of learning (Luckin, Baines, Cukurova, et. al., 2017). Deeper learning is supported by ‘doing and using’ and students are motivated through highly participative and dynamic learning activities (Scott, 2015). Hence, effective collaborative work is enabled by planning challenging and demanding tasks, delegating authority to the groups, and teacher behaviour to foster effective interaction in groups (Cohen, 1994; cited in Davidson & Major, 2014).

2.3.4.2 Positive interdependence
Two goals of collaborative learning are enabling students to take responsibility for working together and to enable them to build knowledge together (Davidson & Major, 2014). To that end, the notion of positive interdependence is a crucial aspect of collaborative learning. It occurs through a psychological process of expanding interests towards common interest (University of Minho, 2013). Therefore, in collaborative learning, some (but not necessarily all) of the following aspects are usually shared among students of the same group: goals (social and academic), tasks (structured learning tasks or assignments), resources, roles and/or extrinsic rewards (e.g. bonus points for improved performance or public recognition for groups that meet criteria). Sharing resources can be encouraged by limiting the availability of, for example, two information sheets in a group of four or divided into parts as in jigsaw, where each group member has different information to share. Another possibility is to assign pre-set roles, either task roles or maintenance roles. Teachers engaged in collaborative learning tend to use mainly goal and task interdependence and occasionally resources; they are less likely to use assigned roles and rewards (Davidson & Major, 2014).
2.3.4.3 Changing roles for students and teachers

If students are to take responsibility for their own learning, some responsibility for learning needs to shift away from the teacher to the students (Davidson & Major, 2014). However, creating the conditions for this shift of responsibility is not simply a matter of deciding ‘how much’ freedom or discipline a teacher should ‘give’ students. The teacher “must become an organizer of people into communities for a specific purpose-learning. He must restructure freedom and discipline within the class, thereby establishing a ‘polycentralized’ collaborative learning community in which the teacher moves to the perimeter of the action, once the scene is set” (Bruffee, 1973, cited in: University of Minho, 2013).

The programme ‘Active Learning in Maths and Science (ALMS) was developed by the Education Development Centre (EDC) and implemented from June to November 2010 in two Indian States. Its evaluation results suggest concrete changes in the teachers’ role: if teachers wanted to effectively use collaborative approaches, they could no longer “walk in, lecture, and leave”. To facilitate collaborative learning, teachers needed to change classroom inputs (carefully plan instruction and creating learning materials that could engage students over a sustained period of time); change classroom processes (instructional and assessment methods and communication patterns); and change the classroom structure (the role of the teacher and students and interactions between both). They planned instructional experiences for students, circulated among students as needed, interacted with students on a more intimate, small-group level, and promoted students to learn from and help one another. In essence, they had to shift their role from transmitting information to facilitating, guiding and monitoring student learning. Both teachers and students viewed this shift as positive, the latter stating that their teachers became more accessible and less remote (Burns, Pierson & Reddy, 2014).

2.3.5 Assessment

A question that deserves particular attention is how to effectively assess individual contributions to group work. In group work settings it can be difficult to hold individual students accountable. Individual accountability, however, is an important element of collaborative learning: each team member is responsible for a certain task or a certain role. If someone is not doing his/her job, true collaboration is absent (Johnson & Johnson, 1988, cited in: Burns, Pierson & Reddy, 2014). Groups of students are often assessed on the process and/or product and all receive the same grade. In an ideal situation all team members would equally contribute, and the “one-size-fits all” group grade would be appropriate for each student team member (Mentzer, 2014).

The section on formative assessment of this literature review further elaborates the importance of formative assessment.

2.3.6 Technology

ICT can facilitate and enhance collaborative learning of students and teachers. In particular, can support students as they build and share knowledge together. ICT can offer new possibilities for social intervention, to create collaborative learning environments – communities – that enable students to carry out group activities. Hence, it can potentially facilitate group work, giving students more independence, motivate them, hold their attention and support the
The changing role and competences of teachers: Gaps in teacher education

Adaptation of tasks to different student capabilities, which can especially help students with learning difficulties, while increasing opportunities for learning for all. Research in this area consistently emphasises the necessity of considering technology not as an end in itself but as a tool whose main purpose is to help students to learn more efficiently (García-Valcárcel, Basilotta & López Salamanca, 2014).

2.3.7 Barriers

However, the barriers for teachers to implement collaborative learning efficiently are substantial. There is a range of practical challenges teachers can face, from curriculum coverage and behaviour management to designing a task that both stretches and supports. Other challenges include more time spent on preparation, a certain loss of control, the unequal participation of students in the process, or difficulties found in evaluating the learning process and the results obtained of each student (García-Valcárcel, Basilotta & López Salamanca, 2014).

2.3.8 References


2.4 PERSONALISATION OF LEARNING

Katja Engelhardt, European Schoolnet

2.4.1 Defining personalized learning

The aim of personalized learning is “to take account of students’ differences such as ability, conceptions of learning, preferred learning styles and strategies, self-efficacy beliefs and socio-environmental factors such as language use, culture and social background” (Conner & Sliwka, 2014).

Personalised learning can be defined as follows:

Teaching and learning are tailored to meet students’ individual interests and aspirations as well as their learning needs. With personalised learning, the learner actively participates in the design of their learning, including learning goals, self-assessment of progress. (Bray and McClaskey, accessed 16/03/2017)

Differentiated learning, a closely related term can be defined as follows:

Teaching and learning are tailored to meet students’ individual interests and aspirations as well as their learning needs. With differentiated learning, teachers adapt methods to meet learning needs of different learners or groups of learners (Bray and McClaskey, accessed 16/03/2017)

In the table below, Bray and McClaskey (2013) summarize the commonalities and differences between personalization, differentiation, and individualization.

<table>
<thead>
<tr>
<th>Personalization</th>
<th>Differentiation</th>
<th>Individualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>The learner:</td>
<td>The teacher:</td>
<td>The teacher:</td>
</tr>
<tr>
<td>Drives his or her own learning</td>
<td>Provides instruction to groups of learners</td>
<td>Provides instruction to an individual learner</td>
</tr>
<tr>
<td>Connects learning with interests, passions, and aspirations</td>
<td>Adjusts to learning needs of groups of learners</td>
<td>Accommodates learning needs of the individual learner</td>
</tr>
<tr>
<td>Develops the skills to select and use appropriate technology and resources to support learning</td>
<td>Selects technology and resources to support the learning needs of groups of learners</td>
<td>Selects technology and resources to support the learning needs of the individual learner</td>
</tr>
<tr>
<td>Demonstrates master of content in a competency-based model</td>
<td>Monitors learning based on Carnegie unit (seat time) and grade level</td>
<td>Monitors learning based on Carnegie unit (seat time) and grade level</td>
</tr>
<tr>
<td>Employs assessment as learning</td>
<td>Employs assessment for learning</td>
<td>Employs assessment of learning</td>
</tr>
<tr>
<td>Becomes a self-directed learner who monitors progress and reflects on learning based on mastery of content and skills</td>
<td>Uses data and assessments to provide ongoing feedback for groups and individual learners to advance learning</td>
<td>Uses data and assessments to confirm progress and report what the individual learner has learned</td>
</tr>
</tbody>
</table>

In the table above, Bray and McClaskey (2013) summarize the commonalities and differences between personalization, differentiation, and individualization.

Table Personalization vs. Differentiation vs. Individualization (Bray & McClaskey, 2013)
2.4.1.1 The term personalised learning as a meta-construct

Some critics charge advocates of personalised learning with conceptual fuzziness (Fielding, 2006; Cutler et al., 2007; Carr, 2008; Hartley, 2009; Mahony and Hextall, 2009; Needham, 2011; cited in: Praina, Coxa, & et. al., 2013). Not surprisingly, this definitional vagueness also led to overlapping accounts of pedagogies, environments and components reputedly required to optimize personalized learning, and leaves room for interpretation as to how much agency or executive control should be given to, or assumed by, learners or teachers in personalized learning approaches (Praina, Coxa, & et. al., 2013). Sebba and colleagues (2008, cited in: Praina, Coxa, & et. al., 2013) reported that ‘there was a widespread uncertainty as to what was meant by personalized learning approaches used in UK schools’. Cavanagh argued that too much of what is being labelled as “personalized learning” in classroom cannot actually be defined as personalized learning (Cavanagh, 2014).

Therefore, Deed, Cox, Dorman & al. (2014) argued that personalized learning cannot emerge from this heterogeneous characterization as anything less than a meta-construct, “the defining feature being the student imprinting their preferences and approach to learning on the formal educational process”. This approach can be contrasted with more traditional teaching approaches with a “one-size-fits all” feel (Patrick, S., Kennedy, K. & Powell, A, 2013), where the teacher transmits the knowledge and regulates use of time, space and learning routines, with little room for student agency (Deed, Cox, Dorman & al., 2014). Moreover, the concept of personalized learning seems to be underpinned by core values such as encouraging student participation and engagement in learning by putting the learner at the centre of the system, as Field (2007) suggested (Field, 200; cited in: Ewen & Topping, 2012).

As no one single definition of personalized learning exists, teachers, schools and districts need to be provided with a shared definition of what personalized learning is in their context, as well as a clear definition of instructional methods that support personalized learning effectively. (Sota & Mahon, 2016). In the section ‘Elements of effective personalized learning’, some core elements of effective personalized learning will be discussed.

However, the four elements of the working definition developed by the Bill & Melinda Gates Foundation already provide some concrete elements for the implementation of personalized learning in the classroom (Bill & Melinda Gates Foundation, 2015; cited in: Hyslop & Mead, 2015)

1. **Learner Profiles.** Each student has an up-to-date record of his/her individual strengths, needs, motivations, and goals.

2. **Personal Learning Paths.** All students are held to clear, high expectations, but each student follows a customized path that responds and adapts based on his/her individual learning progress, motivations, and goals.

3. **Competency-Based Progression.** Each student’s progress toward clearly defined goals is continually assessed. A student advances and earns credit as soon as he/she demonstrates mastery.

4. **Flexible Learning Environments.** Student needs drive the design of the learning environment. All operational elements—staffing plans, space utilization, and time allocation—respond and adapt to support students in achieving their goals.
2.4.2 Impact of personalized learning

The biggest potential of personalized learning is to meet the demands of an increasingly diverse student population, with differing needs (e.g. language and academic) (Cavanagh, 2014). Early evidence indicates that personalized learning can indeed empower and support teachers to meet their student needs (Hassel & Hassel, 2011; in: Childress & Benson, 2014). Moreover, personalized learning approaches aim to improve students' academic achievement, for example in the UK (Cutler et. al (2007; cited in: Praina, Coxa & et. al., 2013).

Personalized learning allows students to take ownership of their learning, giving them the opportunity to feel valued, motivated, and in control, according to Patrick, Kennedy & Powell, (2013). Furthermore, personalized learning approaches have the potential to change the dynamic between the teacher and the student (Patrick, Kennedy & Powell, 2013). McMahon argued that this approach made students become more aware of their own capabilities and lead to a 'superior self-sufficiency' (McMahon (2010); cited in: (Waldrip, Cox, Deed & al., 2014).

Hargreaves described the positive impact of personalized learning as follows:

“students are engaged in learning and schooling, they show responsibility for and independent control over their learning and behavior, they demonstrate maturity in relating to peers and staff, and they co-design learning and teaching experiences” (Hargreaves, 2005, cited in: Praina, Coxa. & et. al., 2013).

Subsequent support, however, for personalized learning has tended to remain vague about its distinctive features, representing it simply as a way to improve student motivation and learning outcomes (Department for Education, 2006; Sebba et al., 2007; Meyer et al., 2008; Duckworth et al., 2009; cited in: Praina, Coxa. & et. al., 2013). Only few studies have already evaluated the nature of the activities implemented as personalized learning approaches in schools or their impact on student achievement (Praina, Coxa. & et. al, 2013). The few studies available are mostly preliminary reports of initial implementation in a small sample of schools, using experimental methods, partly also because many schools only start to experiment with personalized learning approaches. Once such modules mature and expand, more robust evaluations should be possible (Hyslop & Mead, 2015).

2.4.3 Elements of effective personalized learning

2.4.3.1 Fostering student agency

Praina, Coxa & et al. (2013) suggested to define personalized learning as a productive interplay between:

a. teacher expertise in identifying and addressing students’ ongoing individual curricular needs, and

b. student capacity to develop, over an extended timeframe, increasing independence as learners.

In the literature, the terms teacher and student agency are coined to describe this interplay. This model is based on the general assumption that students have the ability to take more control over their learning. In general terms, “agency is the capacity to act differently while recognizing the constraining qualities of institutional structures or conventions (Giddens, 1984), cited in: (Deed, Cox, Dorman & al., 2014). In the teaching context, however, agency describes the complex interplay between teacher and student control of the learning process. More student
agency empowers students to react in a range of possible ways within a given context or learning space (Deed, Cox, Dorman & al., 2014). This increase in students’ autonomy in how to deal with some task requirements introduces a new element of uncertainty for teachers. In response, they need to develop problem-solving skills and balance effectively structure with freedom (Deed, Cox, Dorman & al., 2014). Hence, teachers and students have an interdependent responsibility within a personalised learning environment (Campbell, Robinson, Neelands, Hewston, & Mazzoli, 2010; cited in: Deed, Cox, Dorman & al., 2014).

The diagram below illustrates the rich reciprocity between student, teacher and contextual interactions and perceptions. The teacher has the power to imagine, establish and maintain a learning environment that supports personalized learning. To that end, he is asked e.g. to generate a culture of co-regulatory relationships and to encourage student responsibility and their problem-solving skills as well as the use of flexible learning spaces (Deed, Cox, Dorman & al., 2014). Hence, the effective personalization of learning depends both, on the teachers’ ability to differentiate learning tasks effectively according to student needs, and the students’ ability to develop their capacity as independent learners (Praina, Coxa & et. al., 2013).

Open Classroom Space (Deed, Cox, Dorman & al., 2014)

Several suggestions come from research as to how to implement personalized learning that fosters student agency. Keffe and Tadich (2009) stressed the importance of the initial transitional stage, where teacher and student roles in this new learning context need to be clarified (Keffe and Tadich 2009; cited in: Waldrip, Cox, Deed & al., 2014).

Examples of teaching strategies that support students’ autonomy and encourage them to take ownership over their learning include the provision of opportunities for students to discuss a variety of approaches and strategies, finding multiple solutions to problems, the use of interactive Web 2.0 technology, and supporting independent problem solvers (Stefanou et al., 2004; cited in: Deed, Cox, Dorman & al., 2014).

Moreover, the teachers’ role will have to change considerably. Teachers will have to come to terms with allowing students to take control and recognize that they do not have all the answers (Deed, Cox, Dorman & al., 2014). New tasks might include curating materials for student playlists and helping them to set their weekly goals. As students advance at their own pace, teachers can devote their attention and instruction where it’s most needed (Childress & Benson, 2014).

Finally, further discussion and research will be necessary to determine the degree of student agency that is desirable or necessary for implementing personalized learning. Ultimately, the answer to this question will depend on students’ capacity to take responsibility for their own learning (Deed, Cox, Dorman & al., 2014) or differently put, to which extent all or some students can be expected to make personal informed choices about what, why, when, where and with whom they learn (Praina, Coxa, & et. al., 2013). Another consideration, according to Sota and Mohan (2016), is that certain rules need to be respected, to ensure that student academic
performance is not adversely affected. For instance, students should not have the possibility to opt out from important academic activities. Furthermore, students need to develop a range of skills and should not be able to select only activities they already do well (e.g., interpreting information in visual formats) and completely avoid developing other important skills (e.g., interpreting information presented aurally) (Sota & Mahon, 2016).

2.4.3.2 Effective teaching strategies

Translating the abstract concept of personalized learning into practical pedagogy is a complex task (Lee and Wiliam 2005; in Deed, Lesko & Lovejoy, 2013). A variety of instruction methods reputedly support personalized learning (Hassel & Hassel, 2011; in: Childress & Benson, 2014). Different approaches and instruction methods are likely to take into account a number of general goals and elements. For instance, teachers need to support students’ meaningful goal-setting, and provide an engaging curriculum that offers timely strategies and learning experiences to address student goals (PRAINAI, COXA & et. al., 2013). Moreover, teachers and learners need to be willing to experiment with new tools to explore their potential for enabling choice, creativity, participation, personalization, productivity and self-direction for learners (McLoughlin and Lee, 2007; cited in: Scott, 2015). Finally, teachers need to design instruction that is rigorous, flexible and adaptable, and focus on critical thinking and metacognitive practices to develop stronger, deeper, independent learning. (Patrick, Kennedy & Powell, 2013).

Several authors already summarized the main elements of effective personalized learning in practice. The definition of (Hyslop & Mead, 2015), for instance, focuses on the different levels of personalization. It includes the following elements:

- Students can experience different content that engages them by reflecting their interests
- Students can work through content in different sequences
- Students can progress through content at different speeds
- Learning is assessed when students are ready to demonstrate mastery, not just at the end of a grade or course

Further, McLoughlin and Lee (2008; cited in Scott: 2015) provided a definition that focuses on concrete competencies, strategies and methods, that are likely to be elements of personalized learning:

- digital competencies focusing on individual creativity and performance
- strategies for meta-learning, including learner-designed learning
- inductive and creative modes of reasoning and problem-solving
- learner-driven content creation and collaborative knowledge building
- horizontal (peer-to-peer) learning
- social tagging
- collaborative editing
- peer review

Finally, the definition of Patrick, Kennedy & Powell (2013) focuses on the following opportunities for students that effective personalized learning should provide:

- relationship between the teacher and the student
- strong sense of community within the class as a whole
- students’ right to access learning experiences that enable them to progress according to their level of ability
- opportunities for students to make decisions about the direction of their learning
- content that addresses their personal learning needs based on their interests, parental input, and teacher observation as well as assessment data
- students managing their own work calendars and daily schedules
- students using personal learning devices

Considering all the suggested elements of personalized learning, it becomes evident, that their implementation is a challenging task for teachers. Therefore, Sota & Mahon (2016) recommended teachers to “start small”, with personalizing learning with a single lesson or unit and later on adding more elements of personalized learning gradually. This approach keeps change-making manageable, and enables teachers and schools staff to more easily evaluate the effectiveness of those changes. (Sota & Mahon, 2016). Finally, Praina, Coxa & et. al. (2013) viewed personalized learning approaches as necessarily developmental. Therefore, they require a range of teacher and learner strategies, experiences and understandings over an extended timeframe, leading to eventual student capacity to co-design their curriculum with their teachers.

2.4.3.3 Identifying student needs vs. Tagging students

As discussed in the previous section ‘Defining personalized learning’, the core claim of personalized learning is to meet students’ individual interests and aspirations (Bray and McClaskey, 2013). The goal is to enable all students to meet high academic standards and develop their full academic potential (Jackson and Davis, 2000; cited in: Praina, Coxa & et. al., 2013). Various critics have long regarded differentiation as creating and legitimating the very differences it claims to accommodate by creating a pedagogical imperative to reify student differences, and adopt a style of selective, streamed teaching at odds with mixed ability teaching (Dowling, 1990; Goldstein & Noss, 1990; Hart, 1992). However, Jackson and Davis (2000) argued that the concept does not refer to long-term streaming or tracking, but to short-term differences in content or strategies specific to particular units, based on responses to students’ performance (Jackson & Davis, 2000; cited in: Praina, Coxa & et. al., 2013).

In practice, however, identifying and addressing individual student needs remains a challenge (Waldrip, Cox, Deed & al., 2014). Already Jackson and Davis (2000) and Tomlinson (1998) acknowledged two significant challenges with implementing differentiation: teacher time, skills and resources to implement differentiation; and parental belief that equity requires educational sameness in the treatment of students (Jackson and Davis, 2000), Tomlinson (1998); cited in: Praina, Coxa & et. al., 2013). Tomlinson et al. (2003) suggested that this approach can only work if there is ‘persistent, sustained leadership and support’ (Tomlinson et al. (2003); cited in: Praina, Coxa & et. al., 2013).

2.4.4 Role of technology

“(T)he rapid expansion of technological advances and availability makes a level of personalization possible at scale as never before.

Jobs for the Future & the Council of Chief State School Officers, 2015

As discussed previously, the main potential benefit of personalized learning is being able to meet the needs of an increasingly diverse student population. Technology, in the view of many, offers a powerful tool for achieving that goal. Digital devices, software and learning platforms offer “a once-unimaginable array of options for tailoring lessons to students’ needs - and for collecting data on each student’s individual performance” (Cavanagh, 2014). Moreover, technology can help to maximize the cost effectiveness, efficiency, and reach of personalized learning (Hyslop & Mead, 2015).

Nonetheless, personalized learning models vary in their use of technology. While many use technology to support greater personalization, technology is not a requirement. Teachers can
also customize learning experiences by allowing greater student choice in traditional classroom settings and assignments, or by providing and formally recognizing learning opportunities outside the classroom (Hyslop & Mead, 2015). Two major affordances of technology for personalized learning are blended learning and use of data, as discussed below.

2.4.4.1 Blended Learning
The concept of personalized learning is often conflated with the concept of blended learning (Hyslop & Mead, 2015). Blended learning, however, combines traditional teaching with technology, so that students learn in both real classrooms and virtual classrooms. It can provide tools for creating new learning pathways and flexible learning environments. However, absent of other changes it stops short of full personalization (Hyslop & Mead, 2015). First, technology needs to allow students to access multiple resources and contents and to keep track of their learning paths, e.g. via data dashboards and a personalized learning map for enhancing a student's choice of path (Praina, Cox & et. al., 2013). Second, blended learning designs need to shift instructional models to enable increased student-centered learning, so that students have increased control over the time, place, path, and/or pace of their learning pathways (Patrick, Kennedy & Powell, 2013). Hence, the key to ensuring that blended learning is beneficial to students is to focus on how it enables personalized learning and instruction. In other words, blended learning is a possible delivery mechanism for personalized learning (Patrick, Kennedy & Powell, 2013).

2.4.4.2 Use of Big Data
Data has the potential to transform education from a model of mass production to a personalized experience that meets the needs of individuals and ensures that no student is lost along the way. Data Quality Campaign, 2016

Robust longitudinal data systems available can enable schools to design a whole school approach to personalized learning. To that end, prioritizing the effective use of data at all levels, from kitchen tables to school boards becomes necessary (Data Quality Campaign, 2016). First examples of schools experimenting with whole school approaches to personalized learning using big data already exist. For instance, in the Whittemore Park school in South Carolina, students follow their own schedules and receive the majority of their lessons digitally. The teachers’ role is to work with students to develop and execute learning path to meet them wherever they are, interact with students in small groups, and use data from assessment tools to gain a deeper understanding of each student's individual abilities and needs (Childress & Benson, 2014).

2.4.5 Whole school approach
Personalized learning can be supported at a variety of levels – from the individual classroom to whole-school models (Hyslop & Mead, 2015). While this review mainly focuses on aspects that are implemented in the classroom, this section will discuss personalized learning as a whole school approach. A schools’ capacity to implement a school curriculum that enacts personalized learning depends not only on the use of technology discussed in the previous section, but on many factors, including school leadership, teacher skill sets and practices, and learner capacities and goals. Teachers need to develop a flexible curriculum that is adequately structured in content, learning tasks, and adaptable classroom practices to engage all learners and address contrasting learner needs (Waldrip, Cox, Deed & al., 2014).
Sebba and colleagues (2008) argued that personalized learning included five key components: assessment for learning (AfL), effective teaching and learning (including grouping and ICT), curriculum entitlement and choice, school organisation (e.g., workforce remodelling), and beyond the classroom (e.g., extended schools) (Sebba, 2008; in: Praina, Coxa & et. al., 2013). Therefore, true personalized learning calls for a ‘rethinking and redesign’ of schools, which could include an overhaul of classroom structures and schedules, curricula and the instructional approaches of teachers, according to Calkins (cited in Cavanagh, 2014).

Some interesting concrete examples of whole school implementation of personalized learning came out of a study of personalized learning in the UK that included questionnaires from 347 schools, conducted by Sebba and colleagues (2008). When asked about their initiatives to reflect their school's philosophy of personalized learning, 54% of secondary schools stated that most classes were grouped by ability, 69% of all schools said that they used open-ended learning challenges, and 64% indicated that they encouraged student autonomy and choices. Other strategies mentioned were targeted interventions (88%), enrichment and extension for all (77%), gifted and talented programmes (71%) and topic days/weeks (71%) (Sebba et al., 2008; cited: Praina, V., Coxa, P. & et. al., 2013).

Finally, Taege, Krauter, & Lees (2015) described the interesting example of the FLIGHT Academy in Waukesha, Wisconsin, a personalized learning program that functions within a traditional school model. FLIGHT stands for “Facilitating Learning through Integration, Guidance, High expectations, and Technology”. At the FLIGHT Academy, the day starts with a community circle. Students usually have only one or two seminars per day and spend most of their day in “flex time” that is unique for each student. Moreover, the physical layout of the Academy consists of seven different interconnected learning spaces that enable students and advisors to freely rotate to an appropriate space throughout the day (Taege, Krauter, & Lees, 2015). Deed, Lesko & Lovejoy (2013) also argued that personalized learning can use the affordances of virtual, physical and social space, both formal and informal, in and out of school (Deed, Lesko & Lovejoy, 2013).

2.4.6 Teacher training

When implementing personalized learning approaches, many teachers find themselves tackling challenges for which they are not fully prepared and devoting a lot of energy to learning on their own (Jobs for the Future & the Council of Chief State School Officers, 2015). Teacher knowledge about their practice, as the basis for their agency, is generated through questioning of experience, “resulting in a dynamic blend of formal and informal knowledge about teaching and learning” (Hoekstra & Korthagen, 2011; cited in: Deed, Cox, Dorman & et., 2014). In initial teacher training, student teachers could be expected to familiarise themselves with learner-centred approaches by taking greater control of their own learning processes through self-regulated learning behaviours and meta-cognitive skills for developing learning intentions, monitoring and evaluating their own progress, as well as identifying next steps for learning (Conner, 2013; in: (Conner & Sliwka, 2014).

2.4.7 Barriers to personalized learning

Teachers and schools implementing personalized learning approaches still face significant challenges such as prescriptive curricula, particular assessment regimes, the organization of the curriculum, perceived and actual teacher and student roles and responsibilities in and beyond the school setting, and broader social and cultural expectations about norms for teaching and learning processes (Praina, Coxa & et. al., 2013). Another challenge for school leaders is to be
able to collect and use data to personalize learning, while safeguarding sensitive student data (Cavanagh, 2014). Further, teachers often still lack the required skills and even beliefs about flexibility in teaching approaches and student grouping (Cutler et al. (2007), Mahony & Hextall (2009), Meyer & colleagues (2008); cited in: Praina, Coxa, & et. al., 2013).

2.4.8 References


Childress & Benson (2014). Personalized learning for every student every day. Phi Delta Kappan, v95 n8 p33-38


ANNEX

1: CONSULTATION SURVEY

(Offline English language version, used internally only)

Teacher Education in New Competences: Consultation with training providers

Introduction

This survey aims to gather information from providers of initial teacher education (ITE) and continuing professional development (CPD) about how teacher competences are being developed to support personalisation, assessment, collaboration and creativity.

The survey is part of the Teach-UP policy experimentation [link to web site] coordinated by European Schoolnet. It should be completed by an administrator or programme manager with an overview of course content. The questionnaire should take no longer than 15 minutes to complete. Please answer from your own point of view rather than giving an official organisation view.

Information gathered will be analysed and published in a report on gaps in current teacher competence development. No individual or organisation will be identified and participants will receive notification when the report is published.

Thank you for your contribution to this important work.

Closing date: 22nd May 2017.

Questions

[No questions are compulsory]

A: GENERAL

1) In which country is your organisation located? [Austria, Belgium, Estonia, Greece, Hungary, Lithuania, Malta, Portugal, Slovakia, Spain, Turkey, Other:] Alphabetical dropdown list of partner countries

2) Organisation details.
   [Multiple text box]
   Name of organisation:
   Town or city:

3) Which category best describes your organisation? Tick one category. [Matrix plus other:]
   o University / higher education
   o Ministry of education
   o Public authority / organisation
The changing role and competences of teachers: Gaps in teacher education

4) What type of training does your organisation provide? [Matrix]
   - Initial teacher education (i.e. pre-service training)
   - Continuing professional development (i.e. in-service training)
   - Both initial and continuing teacher education

5) How is training provided by your organisation? [Matrix]
   - Face-to-face only
   - Online only (e.g. in a MOOC or learning platform)
   - In a blended learning environment (i.e. a mix of face-to-face and online learning)

5.1) [If face to face, then]
   [IF YES:]
   [Matrix]
   Please indicate the percentage of training time spent observing and/or practice teaching in a school (i.e. outside the organisation)
   - 0 – 10%
   - 10 - 20%
   - 20 - 40%
   - 40 – 60%
   - over 60%

5.2) [If blended, then]
   Please indicate the approximate percentage of training time spent.
   [Matrix for three items]
<table>
<thead>
<tr>
<th></th>
<th>0-10%</th>
<th>10-20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>Over 60%</th>
<th>Not possible to say / varies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In your organisation</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>In school (i.e. observation and practice teaching)</td>
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<td></td>
</tr>
</tbody>
</table>

B: PROVISION

The following questions are about your views on ITE and CPD provision in:
   - Formative assessment
   - Personalised and differentiated learning
   - Collaboration among learners
Formative assessment may be defined as: “Those activities undertaken by teacher, and by their students in assessing themselves [that is, students’ assessment of their own work as well as their peers], which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. Such assessment becomes ‘formative assessment’ when the evidence is actually used to adapt the teaching work to meet the needs.” (Black and Wiliam, 2001).

6) “In my view, this organisation provides sufficient opportunities to develop teachers’ competence in the formative assessment of student learning.” To what extent do you agree/disagree with this statement?

[Matrix]
- Strongly agree
- Partially agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

7) How does your organisation support teacher competence development in formative assessment?

[Matrix]

<table>
<thead>
<tr>
<th></th>
<th>Compulsory and online</th>
<th>Compulsory and face-to-face</th>
<th>Optional</th>
<th>Not supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through course work dedicated to theories and methods of formative assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated within courses on general didactics</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Integrated within courses on specific subject areas (e.g. teaching and assessment of mathematics)</td>
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<tr>
<td>As part of teaching practice for student teachers</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
8) To what extent do your courses include the following teacher competences for formative assessment? [Matrix]

<table>
<thead>
<tr>
<th></th>
<th>0-10%</th>
<th>10-20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>Over 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating classroom cultures to encourage interaction and use of assessment tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structuring classroom dialogue and questions to engage learners, provoke thought and identify misconceptions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosing sources of learner misunderstanding</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Providing feedback that is timely, task-focused and appropriate to the student’s level</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Developing learners’ skills for self- and peer-assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Using evidence of student learning to develop next steps in teaching</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using technology platforms that support student interaction and self- and peer-assessment</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Personalised and differentiated learning**

While there are some differences in personalised and differentiated learning approaches, many of the teacher competences required for these approaches are very similar. We have thus combined these two areas within this questionnaire.
Personalised learning is defined as follows: *Teaching and learning are tailored to meet students’ individual interests and aspirations as well as their learning needs. With personalised learning, the learner actively participates in the design of their learning, including learning goals, self-assessment of progress.* (Bray and McClaskey, accessed 16/03/2017)

Differentiated learning is defined as follows: *Teaching and learning are tailored to meet students’ individual interests and aspirations as well as their learning needs. With differentiated learning, teachers adapt methods to meet learning needs of different learners or groups of learners* (Bray and McClaskey, accessed 16/03/2017)

9) “In my view, this organisation effectively develops teachers’ competences for personalisation and/or differentiation of learning.” To what extent do you agree/disagree with this statement?
[As Q6 above]

10) How does your organisation support teacher competence development in personalised and/or differentiated teaching and learning?
[As Q7 above]

11) To what extent do courses include the following teacher competences for personalised and differentiated learning?
[Matrix]

<table>
<thead>
<tr>
<th>Knowledge of pedagogies appropriate for learners’ culture, language, socio-economic background, special education needs</th>
<th>0-10%</th>
<th>10-20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>Over 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing learning environments to allow time for differentiated learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing a repertoire of activities and assessment procedures appropriate for diverse learner needs and interests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promoting collaborative and real-world project-based learning opportunities (possibly enhanced with digital)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Collaborative problem solving among students

Collaborative problem solving among students involves joint recognition and understanding the nature of a problem; communication, negotiation and exchange toward a plan to address the problem; coordinated action to carry out the plan, monitoring of progress; and, if necessary, adaptation of the strategy. (adapted from Griffin, 2014).

12) “In my view, this organisation effectively develops teachers’ competence to support collaborative problem-solving among learners.” To what extent do you agree/disagree with this statement?

[As Q6 above]

13) How does your organisation support teacher competence development in collaborative problem-solving among learners?

[As Q7 above]

14) To what extent do courses include the following teacher competences for developing learners’ collaborative problem-solving?

[Matrix]

<table>
<thead>
<tr>
<th></th>
<th>0-10%</th>
<th>10-20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>Over 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing a repertoire of structured activities for collaborative problem-solving in specific subject domains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurturing student communication skills (listening, questioning, understanding explaining, debating, negotiating) appropriate for age groups taught</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurturing students’ skills to develop appropriate problem-solving strategies and to monitor and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nurturing learner creativity

Creativity is relevant to every domain of knowledge and to every school subject, and therefore as a fundamental competence to be developed at school. Learner creativity may be nurtured through attention to creative ‘habits of mind’ (inquisitiveness, persistence, imaginativeness, collaboration and discipline) (Lucas et al., 2013).

Learners are encouraged to experiment and learn through trial and error, to take risks, to keep open minds, to apply skills and knowledge to real life, engage in divergent thinking, to challenge ideas, and to tolerate ambiguity (Albert, 1996; Timperley et al., 2007; IPTS, JRC, EUN, 2009).

15) “In my view, this organisation effectively develops teachers’ competence to nurture learner creativity.” To what extent do you agree/disagree with this statement? [As Q6 above]

16) How does your organisation support teacher competence development in nurturing creativity? [As Q7 above]

17) To what extent do courses include the following teacher competences to nurture learner creativity? [Matrix]

<table>
<thead>
<tr>
<th>Creating learning environments that support learners’ creative habits of mind (inquisitiveness, persistence,</th>
<th>0-10%</th>
<th>10-20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>Over 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>reflective on their progress</td>
<td></td>
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<tr>
<td>Supporting students’ use of collaboration technologies, including social networks and online open platforms appropriate to the age group taught</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Monitoring and giving feedback to students’ on collaborative processes as well as outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The changing role and competences of teachers: Gaps in teacher education

<table>
<thead>
<tr>
<th>Imaginativeness, collaboration and discipline</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Providing opportunities for learners to experiment and take risks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhancing learner creativity by applying ICT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborating with colleagues to provide opportunities for interdisciplinary learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborating with external professionals to provide real-world learning opportunities</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18) In your opinion, what competence training would you like to offer if budget, time or priorities allowed? [Single text box]

C. CONTACT DETAILS

19) Please leave your name and contact details so that you can be contacted about your responses if necessary and to be notified when the survey report is published. [Multiple text boxes]

Family name
First name
E-mail address

[SUBMIT RESPONSES]

Thank you for completing this survey! Your answers will help identify gaps in provision across ten countries. [link to Teach-UP project page].
2: National definitions

ESTONIA

Teacher collaboration
Divided into two concepts, not understood as a personal competence:

- National teacher collaboration - divided into national subject teacher networks, which are independent in their activities;
- School centered teacher collaboration – activities coordinated by the school’s administrator mainly with the aim of predisposing teachers to thread different subjects and promote integrative learning (e.g. “Chemistry of life” conducted by a chemistry and biology teacher).

Personalised learning
Instructional approach (combining individualization and collaboration) enabling teachers to partition students during learning activities in order to address distinct learning needs of individual students enabling the highest possible individual development.

Formative assessment
Formative assessment shall mean assessment taking place during studies, in the course of which the pupil’s knowledge, skills, attitudes, values and behaviour are analysed, feedback if provided on the pupil’s previous results and shortcomings, the pupil is encouraged and guided in further studies and the future objectives and routes of studying are planned.

Creativity
Capacity for useful originality. (In education this means primarily to the student him/herself.)

GREECE

There are no specific national definitions.

HUNGARY

Teacher collaboration
Collaboration or cooperation is one of the 17 ethical values described in the Ethical Codex of the National Pedagogue Board. The short formulation of this value is as follows:

(15) We aim at cooperation with all those, who work for the efficacy and effectiveness of public education. While we prepare our professional decisions we lead dialogue with all stakeholders.”

Besides this the document also formulates guidelines about how the relationship between teacher and different stakeholders should be. The following stakeholders are mentioned: pupils, parents, colleagues, institution leaders, school district administration and other bodies.

Personalized learning
Instead of personalised learning differentiation is more frequently used in the key documents. Differentiation is defined in the glossary of the National Core Curriculum.

“It means distinction, indicating that we do not necessarily teach every pupil the same thing and in the same way. The essence of differentiation is individualized teaching, adaptation to individual
pupils. We distinguish differentiation of content, which means that the ability and interest of the pupil plays a role in choosing the content. Differentiation can be applied to the methods, tools, and the different pupils’ competence areas to be developed. And we can talk about the differentiation of requirements and when meeting them, about differentiation of pace of progress. This means a distinction between faster and slower learning pupils, but it should not increase lags.

**Formative assessment**

There is no definition and only one mentioning in the National Core Curriculum. Methods of assessment should be defined in the pedagogical programs of schools. One example for definition is to be found in an example pedagogical program for whole day schooling by the Institute for Pedagogical Research and Development.

The type of evaluation can be diagnostic (surveying, measuring status), formative (developing, forming) and summative (recapitulative).

Formative: it is applied as an organic and individually planned part of the teaching and learning process, its role is the detailed mapping of results, frequent feedback and correction of lags.

There are five principles:

1. Continuous and interactive assessment, mirroring the individual learning needs.
2. Understanding the way pupils learn.
3. Aligning learning to individual learning needs.
4. Recognizing the role of motivation in increasing learning efficiency and understanding the methods of building motivation.
5. Fostering better performance and equal opportunities by recognizing cultural and individual differences.

**Creativity**

There is no definition in the National Core Curriculum, although the term is frequently mentioned in it. Berecki, who examined the relationship between creativity and curriculum argues, that in professional discussion the term is often used without definition and stakeholders own a hidden knowledge about creativity that is not based on research, but rather on misconceptions and opinions. The national core curriculum sadly fits to the trend. There is no definition, but it prescribes creativity as a cross-curricular development aim that is relevant to all subject areas and age groups. If examined closely, the individual occurrences of creativity suggest different, sometimes contradictory interpretations of the term.

**LITHUANIA**

**Teacher collaboration**

Collaborate with colleagues, support staff and other professionals, the development of training / learning assumptions and assessment of learning outcomes.

Organization development and change management competence: productively participate in the school’s self-governing institutions and to adequately assess problematic situations in school.
Personalised learning
Students' cognition and recognition competence: evaluation of the student's development, cognitive powers and activities in accordance with the theories of psychology, recognize the different students' approach to learning and create learning opportunities, recognize the student's individuality as a value that guarantees learning progress.

Formative assessment
Students' achievements and progress evaluation competence: choose the types, methods and techniques of students ‘achievements and progress evaluation for the development of students' learning capacity. Students' motivation and support them competence: to help students solve learning problems.

Creativity
Teaching / learning process management competence: use a variety of educational strategies for the development of students' critical thinking, problem solving and creativity.

MALTA

Formative assessment
Assessment for learning (assessment for formative purposes) is a process carried out as learning is taking place. Learners and their teachers use the outcomes to find what learners know and are able to do in relation to learning.

Personalised learning
A learner-centred approach to learning and teaching requires: (i) active and personalised learning (ii) relevant, meaningful and purposeful engagement on the part of the learners (iii) negotiation among learners and teachers (iv) the development of knowledge, skills and attitudes which promote self-directed and lifelong learning.

Differentiated learning: different approaches are needed to address different learning needs. With the focus increasingly on the learner, and with more mixed-ability classes in schools, differentiated approaches are becoming more important and teachers need to adopt strategies that build on children’s and young people’s previous learning and help them progress.

Co-operative learning - the co-operative learning concept allows a learner to actively engage with his or her peers. In doing so they are together able to learn several processes such as processing and synthesising information, solving problems, and creating products together. Such a context also allows for social development among students. This will ensure that the learning moves towards learner-centred approaches.

Creativity
A whole-school approach promotes a climate conducive to creativity which constitutes a vital source of flexibility, adaptability and the capacity to innovate. Creativity and Innovation is about developing: affective, communication, lateral thinking, originality, emotional development, effective communication, leadership, questioning, intuition, critical thinking, problem-solving, fostering entrepreneurial mindsets, openness to cultural diversity and self-expression.
PORTUGAL

Today’s societies are confronted with unpredictability, complexity, diversity and the need to achieve sustainable development based on a balance between social, environmental and economic domains. At the same time, the emergence of new logics of social interaction among young people - resulting from globalization, multicultural coexistence and the massive deployment of the internet and social networks – are questioning the primacy of the school as a place of learning and knowledge, posing new challenges. How can we reshape the traditional school in order to answer to these challenges and enable motivated, autonomous and responsible people and active citizens? And how can we contribute to reinforcing the identity matrix of the school, which differentiates it from other non-formal or informal educational contexts?

Aware of the need to renew the school, the Portuguese Ministry of Education has a national strategy in place, in which various educational agents participate, involving a set of measures that complement each other. In this strategy, the definition of the "Profile of the Pupil after compulsory schooling" - a humanist-based profile that takes into account diversity and the inclusion of all students - sets the framework for other measures aimed at transforming the School:

- the flexibility of the curriculum to meet the learning needs, interests and backgrounds of each student;
- the reduction of the curricula to a core set of items termed “essential learning”, in order to create time for the development of individual and collaborative activities, namely, project based learning, which promotes key competences such as reasoning and problem solving, critical and creative thinking;
- learning is also to take place within the scope of a national strategy for citizenship, in order to promote interpersonal relationships and the exercise of full citizenship, respecting the values of solidarity, democracy and freedom.

Continuous Professional Development (CPD) of teachers as well as Initial Teacher Education (ITE) play key roles in this process, because they must hold specialized scientific, didactic and epistemological skills and knowledge to assure the quality of the learning processes.

Formative evaluation, or evaluation for learning, has been pointed out since the 90’s as one of the strategies that, most strikingly, induces learning gains. It consists of designing tasks that can gather evidence of what students know and are able to do, give feedback, and redesign new tasks that promote learning progression. In other words, formative assessment is the basis of individualized instruction, permeating all the above-mentioned policy measures. In this way, formative evaluation and individualized teaching are key contents to be addressed by teacher training initiatives that the Portuguese Ministry of Education intends to develop in the near future.

On the other hand, it is necessary to design and to implement modalities of CPD and ITE, promoting collaborative work between teachers. Online networks facilitate the creation of communities of practice of teachers, allowing the exchange of ideas, experiences, teaching strategies and teaching resources. These communities may play an important complementary role to traditional ‘time-limited’ training courses.
<table>
<thead>
<tr>
<th>Pre-school teacher</th>
<th>Elementary Education Teacher</th>
</tr>
</thead>
</table>
| **Cognitive competence** - a level of knowledge and system of education. A. general basic knowledge from fields of study, mother tongue  
B. professional education, i.e., knowledge from educational sciences, psychology, special pedagogy  
C. Artistic education- music, art, physical education | **Cognitive competence** - a level of knowledge and system of education. A. general basic knowledge from fields of study, mother tongue  
B. professional education, i.e., knowledge from educational sciences, psychology, special pedagogy  
C. Artistic education- music, art, physical education |
| **Organisational-professional competence** – an ability to apply knowledge and skills in practice  
To create positive atmosphere  
To create educational material | **Organisational-professional competence** – an ability to apply knowledge and skills in practice  
To create positive atmosphere  
To create educational material |
| **Evaluation competence** – to evaluate own and pupils’ performance | **Evaluation competence** – to evaluate own and pupils’ performance |
| **Communication skills** | **Communication skills** |
| **Cooperative competence** – to consult issues with partners, parents, authorities | **Cooperative competence** – to consult issues with partners, parents, authorities |

**Teacher of second primary education stage (age 10 -15) and secondary education**

| Cognitive competence - a level of knowledge and system of education. A. a higher level knowledge from his/her fields of study, mother tongue  
B. Professional education, i.e., knowledge from educational sciences, psychology, special pedagogy |  |
| Organisational-professional competence – an ability to apply knowledge and skills in practice  
To create positive atmosphere  
To create educational material |  |
| Evaluation competence – to evaluate own and pupils’ performance |  |
| Communication skills |  |
| Cooperative competence – to consult issues with partners, parents, authorities |  |
| Competence to perform pedagogical research and develop pedagogy as a branch of science |  |
SPAIN

Formative assessment
Formative assessment is defined as: “Those activities undertaken by teacher, and by their students in assessing themselves [that is, students’ assessment of their own work as well as their peers], which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. Such assessment becomes ‘formative assessment’ when the evidence is actually used to adapt the teaching work to meet the needs.” (Black and William, 2001).

Personalised and differentiated learning
Personalised and differentiated learning are defined as follows: Teaching and learning are tailored to meet students’ individual interests and aspirations as well as their learning needs. With personalised learning, the learner actively participates in the design of their learning, including learning goals, self-assessment of progress. With differentiated learning, teachers adapt methods to meet learning needs of different learners or groups of learners (Bray and McClaskey, accessed 16/03/2017).

Creativity
Creativity is relevant to every domain of knowledge and to every school subject, and therefore as a fundamental competence to be developed at school. Learner creativity may be nurtured through attention to creative ‘habits of mind’ (inquisitiveness, persistence, imaginativeness, collaboration and discipline) (Lucas et al., 2013). Learners are encouraged to experiment and learn through trial and error, to take risks, to keep open minds, to apply skills and knowledge to real life, engage in divergent thinking, to challenge ideas, and to tolerate ambiguity (Albert, 1996; Timperley et al., 2007; IPTS, JRC, EUN, 2009).

Collaborative problem solving
Collaborative problem solving among students involves joint recognition and understanding the nature of a problem; communication, negotiation and exchange toward a plan to address the problem; coordinated action to carry out the plan, monitoring of progress; and, if necessary, adaptation of the strategy (adapted from Griffin, 2014).