

**DIRECTORATE FOR EDUCATION AND SKILLS
EDUCATION POLICY COMMITTEE****Future of Education and Skills 2030: Curriculum Analysis****Draft Literature review on aligning pedagogies and assessments with changes in curriculum****10th Informal Working Group
23 – 25 October 2019
Ilsan and Seoul, Korea**

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This literature review explores the way policy levers and other approaches could be used to align pedagogies, pedagogical materials and with changes in curriculum.

Participants are invited to:

- NOTE the preliminary findings from the literature review.
- SEND their comments before 1 November.

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JT03452026

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Abstract

This literature review explores the way policy levers and other approaches (e.g. teacher-led or school-led initiatives) could be used to align pedagogies, pedagogical materials and resources (such as textbooks and assessment) with changes in curriculum. It goes on to explore the key stakeholder groups involved in such alignment and the effectiveness or impact of policies and other processes on aligning pedagogies and pedagogical resources to changes in curriculum. It tries to identify strategies used in countries that were successful in aligning pedagogy and assessment to changes in curriculum, the barriers or challenges associated with for aligning curriculum and assessment, the ways stakeholders address them in different countries. It goes on to try to identify, in relation to aligning curriculum, pedagogy and assessment:

- any subject-specific concerns
- examples of good practice in jurisdictions encompassed by the 12 research reviews and comparative studies examined in this review.
- the documented impact of aligning curriculum, pedagogy and assessment on student learning, on teachers and on teaching.

The review concludes with an exploration of the gaps in the research revealed by the review and its many detailed framing questions.

1. Literature review on aligning pedagogies and assessments with changes in curriculum

1.1. Introduction

The researchers of this review were commissioned to look for evidence to address what the research has to say, at a detailed level, about aligning curriculum, pedagogy and assessment. This paper provides an itemised overview of responses to questions.

We have found the following after a two-month long search and analysis process. First, the practices explored and the definitions of what is meant by the curriculum vary significantly between jurisdictions and between research reviews and studies. Second, we have found that alignment between pedagogy, curriculum and assessment is tackled rarely in a coherent or even connected way.

Although we found very few studies and even fewer research reviews that focus directly on such alignment we did find a number that report on such alignment as an outcome of policy implementation, as one of a number of tools for implementing new policies or as a challenge to be addressed.

Thus, this report has an evidence base to draw on but it is not itself as aligned, coherent nor well theorised as it could be. For example, the nearest we got to clarity of definition around alignment of this kind in the studies we surfaced was when Napper (2012^[1]) defined alignment of learning, teaching, and assessment as a process where skills, assessment of learning, learning objectives, anticipated knowledge and/or dispositions of instruction interact and support learning outcomes.

This is probably an artefact of the difficulty of researching such a complex set of variables which interact dynamically, not just a result of the way in which different jurisdictions approach policy in this arena. Either way, it remains the case that what emerges from the research evidence about aligning curriculum, pedagogy and assessment is often fragmented. It is occasionally illuminating and best understood, at least in an empirical context, at this stage as a jigsaw for which we do not yet have a picture and where some pieces are missing.

This suggests that the OECD's focus on alignment is an important and timely one. Problems arising from lack of alignment between curriculum, pedagogy and assessment may be reported keenly in the press, and by policy makers and practitioners. But effective responses to such concerns do not yet seem to be reflected *very directly* in the research.

There are a number of reasons for this:

- Research necessarily lags behind policy and practice because it is focused on recording, analysing and exploring things that have happened.
- Research is constrained by time and resources.
- Research requires that the issues being explored are bounded to enable clarity of focus and reliability of evidence. But curriculum and pedagogy are relatively unbounded fields of endeavour and research in their own right. Curriculum in particular can be very broadly defined.

- Just as policies which seek to create alignment must work across different organisations, timescales and activities, research into alignment must cross multiple disciplines. But, most research teams work within field of the study of curriculum, pedagogy or assessment; sometimes across two of the three.

That said, there are nonetheless some relatively substantial things to say, albeit in a piecemeal way, about particular sub-sets of the evidence in relation to particular questions. Such evidence, once considered and interrogated in a policy context, is certainly capable of supporting evidence-informed hypotheses and think pieces about alignment. This will be particularly true when it is possible to juxtapose this evidence with an analysis of the role of continuing professional development (CPD) in alignment because CPD which features heavily in this literature as a tool for alignment, but which lay outside the remit for this review.

1.2. Description of methods

Initially researchers created a list of key search terms based on the area of research. These terms included the following: curriculum, assessment, pedagogy, alignment and mapping. Using a combination of the terms mentioned a literature search was conducted using search engines such as EBSCO. Reviews and studies which met the researchers' criteria (e.g. must be secondary and published since 2000) were selected and saved; empirical reviews were preferred over single studies because of the stronger weight of evidence. Researchers then scanned the abstracts of the selected reviews/articles to identify articles that were relevant and remove any which did not meet the criteria set by the project. Researchers identified potential cornerstone reviews (4-6 reviews). These were mapped against the project criteria to identify gaps between the literature surfaced so far and the detailed review questions. Targeted searches were then carried out, this time including large scale, highly relevant single studies that filled in gaps. As a result, researchers were able to identify an array of reviews and studies that addressed OECD's review questions. The resulting shortlist of reviews and studies were then analysed for evidence relevant and the results are summarised in this report.

The initial literature search started with over 30,000+ results for the initial search terms. The filtering process reduced this number to 636 results. A second stage of filtering reduced the pool to 19. Using a grid mapping exercise to check the relevance of reviews and studies via abstracts, this established 4 possible cornerstone reviews (Krajcik, McNeill and Reiser, 2008^[2]; Wallace and Priestley, 2017^[3]; Schutte, McCullick and Line, 2018^[4]; Sekulich, 2019^[5]).

The second round of the literature search began with 2500+ approx. results for the search terms. Again, using the conditions the relevant sources were reduced to 357 results. The number of relevant sources was further reduced to 12. Using a grid mapping exercise to check the relevance of reviews and studies via abstracts, this established 4 more possible cornerstone reviews (Watt, 2016^[6]; Das et al., 2014^[7]; Maude, 2014^[8]); (Das et al., 2014^[7]; Philips, 2000^[9]). Data extraction was then complete for the eight potential cornerstone reviews and for three additional cornerstone studies identified as important in filling in gaps (CUREE, 2019^[10]; Isaacs, 2014^[11]; Creese, Gonzalez and Isaacs, 2016^[12]).

1.3. What are the identified ways or processes in which policy and non-policy levers are used to align pedagogy and assessment with changes in curriculum?

Creation of curriculum guidance materials, particularly textbooks, during curriculum reform processes that specify learning outcomes, objectives, and learning outcomes can facilitate alignment among pedagogy, assessment, and changes in curriculum. The degree to which use of such materials, including textbooks, is mandated varies greatly.

In a number of cases, there is an assertion or assumption that the guidance materials will help to secure alignment between pedagogy, assessment and the curriculum. But there is rarely much evidence about whether this worked. Eight out of eleven of the reviews explored the creation and use of guidance materials in a number of systems to align pedagogy and assessment with changes in curriculum. They are used to provide structure and, in some cases, increase coherence in the way in which the curriculum and, occasionally assessment is implemented. A systematic review of the Australian curriculum reforms by Watt (2016^[6]) explored the use of a collaborative process involving the Council for the Australian federation and stakeholders from both states and territories, in writing guidance.

Defining clear learning outcomes and objectives

Defining clear learning outcomes and objectives including the creation of standards emerge in several studies and reviews as making a contribution to aligning pedagogy, curriculum and assessment in eight out of eleven of our reviews. Four (Das et al., 2014^[7]; Krajcik, McNeill and Reiser, 2008^[2]; Philips, 2000^[9]; Wallace and Priestley, 2017^[3]) of the reviews mentioned the importance of defining outcomes and objectives for aligning assessment and pedagogy with changes in the curriculum. In this broad context, one review, (Schutte, McCullick and Line, 2018^[4]) explored the importance of a collaborative process for defining standards which encompassed the perspectives of teachers, leaders and students, which included (though in passing rather than as a main focus) links between pedagogy, assessment and the curriculum.

Level of specificity of central prescription and delegation to local authorities

Three reviews (Watt, 2016^[6]; Sekulich, 2019^[5]; CUREE, 2019^[10]) mention the level of specificity of central prescription and the degree of local or regional delegation as an important lever for change. The creation of a common core set of requirements to anchor delegation of decision making to local levels, such as the regional, district or school levels) coupled with guidelines to structure local/regional interpretation/implementation, builds coherence. These kinds of activities are relevant to enabling alignment of curriculum, pedagogy and assessment, even though alignment was not the activities' main nor core purpose.

There was also significant variation in the extent to which such delegation was jurisdiction/system- specific. For example, one study (CUREE, 2019^[10]) examining the construction of teachers' professional identities across the following jurisdictions Chile, Berlin, Kenya, Singapore, Scotland, Ontario and Sweden, found that such patterns of delegation reflected both the size of the country and broader patterns in central and local decisions making arrangements.

Nonetheless, within four of the jurisdictions there is a significant element of local delegation in curriculum implementation or the interpretation of curriculum guidelines, which in turn created increased scope for misalignment of pedagogy, curriculum and

assessment. With one of the jurisdictions (Scotland) this operated at a school level, in order to ensure requirements are specific to the need of the schools and the communities they serve. This points to a level of additional complexity within the point about misalignment made above – misalignment can occur at a municipal/local authority level (i.e. divergence between municipalities) or at a school level, in which case the scale and extent of the misalignment would be expected to be more pronounced.

Specification of assessment and curriculum reform as a contributor to alignment.

In some studies, assessment is positioned as a contributor to alignment between what students are expected to learn and curriculum reforms, but we did not find similar arguments or findings about the role of pedagogy in making such connections. Philips (2000_[9]) maps the characteristics of curriculum reforms. This study suggests that assessment programmes aimed at increasing monitoring of student learning and close state control over teacher performance result in tighter specification of what students are expected to learn.

A less prominent theme embedded within evidence about system-wide education reforms relates to changes to curriculum specifications linked to standards/learning outcomes. Some systems such as Singapore (CUREE, 2019_[10]) and New Zealand (Philips, 2000_[9]) expect regular curriculum change and review. For example, Singapore updates its national curriculum every 5 years and link these updates to changing needs in the education system. Regular review of the curriculum increases opportunities to increase alignment and/or to change different aspects of implementation, in ways that draw curriculum, assessment and pedagogy further apart. The purpose of the review, and the extent to which alignment is in view as a specific goal, are more important than the rhythm of curriculum change.

Defining learning (and teaching) experiences

Defining learning (and teaching) experiences is seen as helpful in a range of ways in aligning pedagogy and assessment with curriculum changes. This is highlighted in particular by two studies (Philips, 2000_[9]; Wallace and Priestley, 2017_[3]). A particular approach to defining learning experiences is explored in a paper investigating curriculum reforms in Scotland (Wallace and Priestley, 2017_[3]), where the curriculum is defined as encompassing achievement objectives, learning experiences, and valued skills and attributes of students (Education Scotland, n.d.). In this context, alignment is particularly complex because of the breadth of the definition. It is notable, however that the definition of curriculum in the paper does not encompass assessment.

Recognising the complexity of effective curriculum and assessment policy reform

An important aspect of effectively aligning pedagogy, curriculum and assessment policy approaches is recognising the depth of factors that affect and are affected by them. Creese, Gonzalez and Isaacs (2016_[12]) examine a range of jurisdictions defined as high performing based on their results in PISA 2009 (specifically: Australia (New South Wales and Queensland), Canada (Alberta and Ontario), China (Hong Kong, China and Shanghai), Finland, Japan and Singapore) from the perspective of how their policies and contexts inform the creation of alignment between curriculum and assessment. They also made some comparisons to Massachusetts and Florida in the United States of America, Massachusetts as a high-performing comparator and Florida as a moderate performer.

They find a wide variety of different possible configurations of regulation guidance, and other aspects of governance which lead to particular policymaking approaches; these

aspects range from the ways in which policymakers create accountability systems (and purposes to which those systems are tasked) to how curricula and its content are managed in the context of vocational pathways.

Perhaps the most significant finding related to key levers for policy makers is the importance of understanding the different elements of education which policymaking impacts. The jurisdictions examined in this study varied widely in their approaches to each individual area (e.g. language of instruction, mathematics, sciences (earth science, biology, chemistry and physics), social studies (history and geography) and vocational/applied subjects), with parallels between them in one being undercut by significant distinctions in others. It is thus important for policymakers to bear in mind not just the question of how to align the curriculum and assessment, but also the question of how they are engaging with the dynamics and complex subdivisions within those foci.

Policy elements that contributed significantly to problems with alignment

A single jurisdiction study by Isaacs (2014^[11]) explored in some depth the factors which contributed to the ultimate withdrawal of a policy reform closely related to alignment of curricula and assessment. This provides a useful exemplification of the many complex factors which influence alignment in the design and execution of changes to assessment systems and the curricular and pedagogical approaches which support them. The paper took as a case study a specific reform to the national curriculum for English GCSEs, which was heavily revised after implementation and subsequently replaced. It identifies four types of contributing factors that made the policy's eventual withdrawal unavoidable and influenced and or inhibited alignment.

Key factors contributing to policy failure with a bearing on alignment included the following:

1. The range of demands made on teachers and their responses - for example,
 - the number of syllabuses teachers were expected to cover
 - the addition of new material to syllabuses
 - teachers' focus on one specific element of the assessment, as a response to statutory requirements (based on a calculation that it bore the greatest yield in terms of improved results which in turn shaped assessment of their practice)
2. The nature and span of activities and organisations the reforms had to encompass – for example:
 - The different policymaking regimes entailed in designing and implementing the policy
 - The “fraying” of regulations pertaining to assessment of the subject across three countries whose schools nonetheless share some assessment regimes (England, Wales and Northern Ireland)
 - Increased responsibilities given to central awarding bodies and the school inspectorate at the same time as the reforms were being implemented; responsibility not just to maintain standards but also to determine them
 - The diversity of assessments being reformed – for example the inclusion of vocational versions of qualifications in a fundamentally academic set of assessments

- The need for greater alignment between many, diverse existing qualifications
3. The technical demands of assessment in particular and the potential for perverse, unforeseen outcomes by issues – for example:
 - The distorting effects of giving increased weighting to one form of standardised assessment (i.e. coursework)
 - The need to use a comparable outcomes framework in order to inhibit grade inflation.
 4. The need for the alignment between policies – for example, unexpected changes in the cohort being assessed brought about through other reforms.

1.4. Who are the key stakeholder groups?

Research literature suggests a wide range of stakeholders are involved in the alignment of assessment and pedagogies with curriculum change. While there is some discussion about the roles these stakeholders play, there is limited research literature about what these groups do to address the difficulties they may encounter in alignment efforts.

Researchers observe that there can be variations between different jurisdictions/countries, but major stakeholder groups who can be involved in alignment efforts include:

- Central Government Ministries and agencies
- Specialist central government agencies with responsibility for educational priorities, curriculum and assessment
- Regional and local government agencies/districts
- Teacher/leaders – professional associations, specialist lead teachers
- Teachers – with regard to enacting the curriculum (and in at least one case, Scotland, designing curriculum)
- School leaders, including faculty leaders and head teachers
- Professional and subject associations
- University faculties and departments

Role of curriculum board or curriculum designers in alignment

Two of the reviews explore the presence of a formal curriculum board or curriculum designers in charge of developing new curriculum and the development, subsequently, of illustrative documentation (Maude, 2014^[8]; Wallace and Priestley, 2017^[3]). Here too, the evidence suggests these stakeholders can be used as a mechanism for increasing alignment, but does not automatically achieve this goal merely by their presence. For example, Wallace and Priestley (2017^[3]) explore how, in the case of Scotland, there has been a deliberate choice on the part of curriculum designers to give teachers more autonomy over curriculum and pedagogy. This has resulted in teachers having a larger degree of freedom to develop site-based lessons, units and themes, with the inevitable effect of decreasing alignment between pedagogy, curriculum and assessment at the system level.

The Isaacs (2014_[11]) study also identifies other key stakeholder groups who have a critical contribution to make to curriculum and in particular assessment reforms. These are individuals charged with designing (and, less prominently in the study, overseeing and regulating) standardised high-stakes summative assessments, such as GCSEs in England, as well as other contributors to the accountability and regulatory system such as inspectorate bodies. The Isaacs (2014_[11]) paper identifies specific elements of the curriculum and assessment reform process which failed as a result of a lack of sufficient understanding of the implications for these broader stakeholder groups of the proposed reforms. The key message from the study could be seen as a repudiation of the assertion that “where there’s a will there’s a way.” The fundamental problems with the reform were not as simple as a lack of willingness to make the reforms succeed; rather, they were related to the complex responsibilities that had to be fulfilled and balanced against each other in the process of enacting the reform. In the context of aligning pedagogy, the curriculum and assessment, this point manifests as a need to have detailed and accurate information about the policy infrastructure which will be affected by reform, including those not immediately obviously connected to it (such as vocational providers in an academic context, as in the Isaacs study).

Role of teachers in aligning curriculum, pedagogy and assessment

Although most of the studies and reviews focus on the role of national policy makers and top-level stakeholders (governments) in securing alignment, some of the research touches upon the crucial role of teachers in aligning curriculum, pedagogy and assessment. This is, of course, pivotal in jurisdictions that choose to delegate a significant curriculum design role. One paper examining reforms in Scotland (Wallace and Priestley, 2017_[3]) analyses teachers’ contributions to securing alignment between curriculum, pedagogy and assessment through curriculum enactment (Priestley et al., 2012_[13]; Shawer, 2010_[14]; Wallace and Priestley, 2017_[3]). The paper highlights the way that the responsibility for curriculum design and interpretation assigned to teachers by government pivots around the way they translate curriculum documents produced by government or policy entities into teachable activities in the classroom.

Another study of policy in Scotland (CUREE, 2019_[10]) highlights the practical and intellectual challenges this poses to teachers and a critical need to develop as complete an awareness as possible of the competing demands on teachers’ attention and time; this lack of time might disrupt policy changes designed to increase alignment from achieving their intended goals.

However, the evidence about teachers’ contributions also highlights the way this can represent a number of barriers or challenges to reforms related to **teachers’ understanding and acceptance, or lack of it, of reforms**. This lack of understanding and/or acceptance of reforms can also contribute to a lack of alignment. Scholars often distinguish the “planned and the enacted curriculum” or the “intended and implemented curriculum” (Kelly, 1999, p. 11_[15]; Clandinin and Connelly, 1992_[16]; Wallace and Priestley, 2017_[3]). Kelly (1999_[15]) referred to the “make or break” role of teachers in implementing curriculum reform; thus, “certainly it is clear that such change can succeed only when teachers concerned are committed to them, and, especially, when they understand, as well as accept their underlying principles” (Kelly, 1999, pp. 14-15_[15]; Isaacs, 2014_[11]). As a result of this critical role of teachers, many papers have stressed the importance of teachers’ ownership and involvement, often integrated in the process of creating alignment between policies for pedagogy, the curriculum and assessment; it is worth noting that here, however, as above, merely making this a priority is not sufficient to effectively implement it.

One study (Isaacs, 2014^[11]) provides a number of rich and well-developed examples of ways in which **teacher behaviour and decision-making** is pivotal to effective implementation of policy reform, including for creating alignment between pedagogy, the curriculum and assessment. Isaacs identifies a number of ways in which the roll-out of a reform of standardized high-stakes assessment in a particular subject floundered, some of which centred on, for example, the ways in which teachers misunderstood the impact of the reform on them in the context of the assessment and accountability measures which they were subject to. In this example, the effect was to cause teachers to identify a specific subgroup of students who were at a critical (from an accountability perspective) grade boundary point; they then focused on these students performance above other groups. This was a negative outcome from the perspective of those designing the reform. It also hindered the ability of the policy change to create effective alignment between the pedagogy, the curriculum and assessment.

1.5. What is the effectiveness or impact of these policies and other processes on aligning pedagogies and pedagogical resources to changes in curriculum?

It is difficult to find detailed, high-quality evidence about the impact of curriculum and/or assessment reforms on student outcomes (or indeed other outcomes). In part, this challenge is due to simple real-world constraints on researchers – it is functionally impossible in all but a few very specific cases to run an evaluation which can conclusively demonstrate the impact of a central policy reform. This is because it is rarely possible to run an experimental design in which some students are exempted from a policy reform for comparative purposes, thus making true experimental testing impossible, especially in terms of determining long-term impacts.

While there are some exceptions to this, such exceptions generally depend on the existence of a policy roll-out which is conducted in stages, a rare occurrence in education policy implementation in the modern era. It is therefore important to note that none of the impacts explored in this section are supported by rigorous experimental data and are instead based on identifying and understanding correlations between policy choices and broader systemic successes.

The papers explored highlighted a range of potential impacts of these policy and other processes on aligning pedagogy and assessment to changes in curriculum with different degrees of specificity. Those where findings were reasonably explicit are highlighted below and include:

- Impact on national systems
- Impact on teacher recruitment and retention
- Impact on quality of assessment
- Impact on relationship between intended and actual commitment

Common factors present in or absent from policy reforms in multiple contexts.

Having acknowledged the limitations of identifying studies that examine the impact of policy changes, what is possible is identifying comparative studies which seek to identify common factors present in or absent from policy reforms in multiple contexts. In one paper (Creese, Gonzalez and Isaacs, 2016^[12]), a series of educational systems were subjected to a series of detailed comparisons in terms of their policy contexts and infrastructure. These systems were selected on the basis of being “high performing systems” in terms of PISA scores (*Australia: New South Wales and Queensland, Canada: Alberta and Ontario,*

China: Hong Kong, China and Shanghai, Finland, Japan), and were then compared to two other systems (*Massachusetts and Florida in the United States of America*).

While this research did not generate rigorous evidence about the impact of their policy choices, it does provide an opportunity to explore differences and commonalities within and between high performing systems, and whether there were any discernible commonalities shared by high performing systems which did not exist in systems which were economically developed but not high-performing in education terms. Due to the large range of areas that the study's authors examined, the findings here are diverse, and no consistent pattern emerged. For example, even though all jurisdictions examined prescribed a combination of summative and formative assessment as part of their curriculum assessment systems, the balance and emphasis varies so significantly that comparison is very difficult.

Creating coherence across policy approaches

Across the jurisdictions as a whole there appeared to be a spectrum of emphasis on formative vs summative assessments, with Finland at one extreme and systems such as Shanghai and Singapore sitting more or less at the other (Creese, Gonzalez and Isaacs, 2016_[12]). While all jurisdictions in the study prescribed a combination of formative and summative assessment, the emphasis shifted dramatically – for instance, Japan and the US states did not have Assessment for learning (ie using an assessment to provide feedback to both the teacher and the students on the learner's progress) as an explicit requirement, unlike the others, while Finland has only one national standardised examination, conducted at the end of high school. Thus, this literature review illustrates the importance of avoiding an approach predicated on the existence of a simple route to success or one-size-fits-all approach to shaping alignment of curriculum, pedagogies and assessments. Instead, those working to shape and implement policy decisions need to focus on creating coherence across a wide range of policy approaches – for example, a system which seeks to implement an approach based on either high-stakes standardised or low stakes formative assessments needs to be aware that teachers will focus on those assessments in their practice, and so any formative assessment processes being developed will need to be embedded within other policies through, for example, performance appraisal. It is notable, for instance, that a number of the systems analysed for this paper are attempting to shift the balance of assessment approaches within their area of control to have a great emphasis on formative approaches to assessment, with Hong Kong, China for example shifting away from “gateway” exams at the end of lower secondary phase (Creese, Gonzalez and Isaacs, 2016_[12]).

Impact of alignment on overall system performance

The comparison of different jurisdictions' policy approaches to developing teachers' professional identities CUREE (2019_[10]) highlights the connections between changes in policy, including those focused on aligning pedagogy, assessment and the curriculum, and different systems' overall performances. The two jurisdictions in this study that perform highly in PISA, Singapore and Ontario, a province in Canada, provide very detailed specification of the standardised curricula accompanied by detailed illustrative guidelines. This level of specification makes the extent to which curriculum, pedagogy and assessment are aligned visible and offers a potential route for increasing such alignment and is significantly more extensive than the level of specification provided in systems whose performance in PISA sits nearer to the mean.

But whilst specification may be helpful in some contexts, it is not universally linked with success, for example, the two jurisdictions in that study with least success also provide detailed specification. One significant factor in linking alignment and positive impacts may be the quality and evidence base of what is specified. In both Ontario and Singapore great care is taken to ensure that what is specified is consistent with the evidence base. In both high performing jurisdictions that which is specified.

Impact of alignment on the quality of the curriculum and teaching

There is also a suggestion in the two studies that curriculum mapping is an effective tool for aligning pedagogy, assessment and the curriculum and also makes a positive contribution to **the quality of the curriculum and teaching** (Sekulich, 2019^[5]). The researchers note that “when a curriculum mapping system is used to inform instruction, “(t)he curriculum mapping and comprehensive course review process serve(s) to improve the quality of teaching and lead(s) to significant improvements in student satisfaction” (Jacobsen et al., 2018, p. 84^[17]; Sekulich, 2019^[5]).

1.6. Barriers or challenges associated with particular policies or other strategies for aligning curriculum and assessment (country-specific)

Creese et al. (2016^[12]) identify a number of barriers and challenges confronting a specific example of a curriculum and assessment policy reform. Key factors contributing to policy failure with a bearing on alignment included the following:

1. Curriculum overload, for example:
 - The number of syllabuses teachers were expected to cover
 - The addition of new material to syllabuses
2. The technical demands of assessment and the potential for distortions, for example:
 - The distorting effects of giving increased weighting to one form of standardised assessment (i.e. coursework)
 - Teachers’ focus on one specific element of the assessment, as a response to statutory requirements (based on a calculation that it bore the greatest yield in terms of improved results which in turn shaped assessment of their practice)
 - The need to use a comparable outcomes framework in order to inhibit grade inflation.
 - The “fraying” of regulations pertaining to assessment of the subject across three countries whose schools nonetheless share some assessment and accountability structures/approaches (England, Wales and Northern Ireland)
 - The diversity of assessments being reformed – for example the inclusion of vocational versions of qualifications in a fundamentally academic set of assessments
 - The need for greater alignment between many diverse existing qualifications

3. The nature and span of activities and organisations the reforms had to encompass – for example:
 - The different policymaking regimes entailed in designing and implementing the policy
 - Increased responsibilities given to central awarding bodies and the school inspectorate at the same time as the reforms were being implemented, such as the responsibility not just to maintain standards but also to determine them
 - The need for the alignment between policies – for example, unexpected changes in the cohort being assessed brought about through other reforms.

While many of these barriers are very context-dependent and do not provide an easy or simple basis for identifying and responding to similar challenges in other contexts, they are nevertheless illustrative of the **variety and breadth of challenges which the efforts to align curriculum and assessment can encounter**.

Alignment and quality

Barriers and challenges to alignment inevitably link with issues of quality. The studies rarely make very direct connections, but the following are worth noting:

- Two of the studies suggest that a challenge or a barrier to aligning pedagogy and assessment with changes in curriculum was a poor match between teacher knowledge, teacher skills, Continuing Professional Development and curriculum as.
- Superficial materials can be counterproductive and exacerbate this, especially if shared prior to professional development (Watt, 2016_[6]).
- In Scotland there has been an increased emphasis on teachers as **curriculum designers** in Curriculum for Excellence which corresponds with a period of decline in Scottish performance in PISA (CUREE, 2019_[10]).

More generally, the research indicates that there is often misalignment between pedagogy and content, in which case assessment seems to be being used as an adhesive for aligning itself, pedagogy and the curriculum. Unfortunately, current research does not provide much more detail on this point and further research would be useful.

Three of the reviews suggest that tensions, often linked to challenges in communication, exist between curriculum reformers whose reforms attempt to revert to what they see as more traditional approaches and those whose reforms seek to introduce new approaches designed to meet newly emerging needs (Philips, 2000_[9]; Maude, 2014_[8]). These tensions relate to alignment; particularly to aligning new proposals to aspects of curriculum, pedagogy and assessment that already exist.

These studies also highlight the existence or the lack of an evidence base to support proposed curriculum innovation as factors in successful policy enactment, including alignment between curriculum, pedagogy and assessment. This challenge is exacerbated by poor communication and or a lack of consultation with relevant stakeholders (Das et al., 2014_[7]).

1.7. What do key stakeholders do to overcome challenges in aligning curriculum and assessment?

Using consultation with teachers to build upon alignment

Consultation and review were noted by some reviews and studies as an important strategies for ownership building and developing genuine and in depth understanding about how curriculum design aligns with assessment. One review argues that the consultation process should be designed to enable develop teacher knowledge to the point where they can make use of high-quality curriculum materials (Watt, 2016_[6]). This argument is based on evaluation of a six-year review of the Australian Curriculum, Assessment and Reporting Authority consultative process that was initiated in December 2014. The review made fifteen recommendations referring to four curriculum priorities designed, inter alia, to foster alignment: “complete development of the Australian Curriculum in all learning areas; institute a six-year cycle of review for the Australian Curriculum; collect information about implementation and international evidence to lead development of the next generation of the Australian Curriculum; and scope options for further development of a curriculum for years 11 and 12” (Watt, 2016, p. 9_[6]).

Collaboration and co-construction with key stakeholders, especially teachers

The collaborative writing of guidance for sequencing and aligning curriculum and assessment when making changes in the curriculum emerged as a successful component of introducing a Federal curriculum in Australia, (Watt, 2016_[6]). Creation of standards though a process of consultation can also help develop coherence among curriculum changes, pedagogy and assessment (Maude, 2014_[8]; Wallace and Priestley, 2017_[3]). One of the ways of doing this was through **co-construction and the inclusion of teacher voices** in the development process which can help stakeholders to avoid the pitfalls involved with, for example, different cross-curriculum priorities (Watt, 2016_[6]; Maude, 2014_[8]).

Delegation or decentralisation of authority

The consultation process explored in several studies encompassed decisions about how much decisions making power should lie at what level. Both the extent of delegation of decision-making about curriculum and pedagogy and the degree to which such delegation sits within guidance frameworks or is supported by illustrative materials are also factors that can have a significant effect on how much alignment between curriculum, pedagogy and assessment is possible.

For example, there is a widespread assumption in the literature that teachers enable or inhibit alignment when they translate curriculum regulations or guidelines and assessment requirements into teaching and learning experiences (Bryan, 2012_[18]; Kelly, 1999_[15]; Van Driel, Beijaard and Verloop, 2001_[19]). Wallace and Priestly (2017_[3]) go further and argue that teachers desire to modify curriculum content to align with their own educational and moral beliefs.

The reviews and studies suggest recognising teachers’ role in curriculum realisation through consultation as a way of creating conditions for effective implementation including alignment (Wallace and Priestley, 2017_[3]). Some jurisdictions go further arguing that empowering teachers to take responsibility as pedagogic and curriculum designers can help all stakeholders to overcome the challenges involved with aligning the curriculum and assessment. This analysis is at its most extreme in Scotland, where policy documents have progressively asked for teachers to take more ownership of curriculum design (Raffe, 2006_[20]).

Reviewing curricula and associated materials

A small number of studies highlight the role of specialists, specialist organisations (e.g. subject associations, and, sometimes, government agencies) and/or Higher Education faculty in review of curriculum and materials (Watt, 2016_[6]; Krajcik, McNeill and Reiser, 2008_[2]) mention, in passing, the potential contribution of such specialist contributions to facilitating greater coherence and, by implication, alignment. According to the reviews and studies it appears that educational policy reforms are only highly effective when they are reviewed, planned and implemented holistically which implies having regard to alignment. However, it is worth noting that this is reported also to be the most challenging way forward (Das et al., 2014_[7]).

1.8. What are the subject-specific concerns relating to aligning curriculum and assessment? If such concerns exists, for what subjects? What are the difficulties? What are the stakeholder responses to these challenges?

The reviews and studies do not usually identify subject specific issues. Even studies or related reform in one particular curriculum area are focused on the process rather than the content of the reform. The small number of subject-specific findings we surfaced comprise:

- In languages, Das et al (2014_[7]) recognises that in the process of introducing new language assessment approaches, the **consultation process** is key and involving key stakeholders, such as teachers will help to avoid the difficulties. Having teachers on-board early will make this transition easier (Watt, 2016_[6]).
- Several studies and reviews highlight teacher misconceptions in relation to the non-linear nature of development, and the importance of identifying and working through misconceptions and the importance of identifying and working through misunderstandings collaboratively in **Mathematics and science**. So, when there is a mismatch such as, the disparity between science teachers' expectations (ways of thinking and doing) and the changes in curriculum development being introduced, standards or guidelines can help teachers to see the relationship between curriculum and assessment (Wallace and Priestley, 2017_[3]). Balancing traditional curriculum with newer concepts can also reinforce the alignment between curriculum and assessment (Maude, 2014_[8]).
- In **Geography** tensions are noted around introducing new curriculum and alignment in relation to inclusion and community issues etc., for example in relation to understanding about the perspectives of indigenous populations on physical and social geographical concepts. (Maude, 2014_[8]).

1.9. What are the associated challenges, strategies, and examples of good practices in regard to the use of pedagogical tools, e.g. textbooks, in aligning curriculum and assessment with changes in curriculum?

The use of (broadly defined) tools in aligning curriculum, pedagogy and assessment features strongly in these reviews and studies, in particular in relation to making changes in the curriculum.

Need for tools in the process of alignment

The **need for tools** is reflected in eight out of the thirteen reviews and studies in relation to, for example, issues in science and maths, where tools were needed to support curriculum implementation e.g. in relation to the non-linear nature of development and the importance of identifying and working through misconceptions and or in relation subjects like geography in relation to inclusion for disadvantaged indigenous populations (Watt, 2016^[6]).

Most studies and review highlighted the importance guidance and illustration documents arguing that they have an important role in aligning curriculum, pedagogy and assessment when making changes in the curriculum, including but not limited to textbooks (Wallace and Priestley, 2017^[3]) e.g. curriculum mapping (Sekulich, 2019^[5]; Krajcik, McNeill and Reiser, 2008^[2]), curriculum materials linking to the standards (Krajcik, McNeill and Reiser, 2008^[2]; CUREE, 2019^[10]) and guidance illustrations (Philips, 2000^[9]; Maude, 2014^[8]; Wallace and Priestley, 2017^[3]).

Maude (2014^[8]) and Krajick et. al. (2008^[2]), report a poor match between pedagogy and content. They argue that assessment can act as a tool – or “the glue” for increasing alignment by specifying what is required in more detail.

These studies and reviews also highlight the need to balance technical quality with ownership building arguing **that feedback cycles and co-construction of guidelines with the profession** are important tools for securing coherence and thus alignment between curriculum, pedagogy and assessment at classroom level. For example, Watt highlights the accomplishment acknowledged by the Council for the Australian Federation, with regard with the national collaboration (The Future of Schooling in Australia: a Report by the States and Territories) in relation to the collaborative writing **of guidance for sequencing and aligning curriculum and assessment** when making changes in the curriculum.

The quality of tools and the impact this has on alignment

The quality of the tools (including guidelines, schemes of learning, textbooks, pedagogic protocols, videos and pupil workbooks) and the way they are used emerges as being important in the context of both high and low quality. In a number of studies, links were made between the quality of tools and the depth of teachers and their leaders’ knowledge in discerning quality and choosing and making good use of tools. The emphasis on the importance of developing teachers’ knowledge and skills in using curriculum and pedagogic tools including textbooks is very often linked with an emphasis on the importance of continuing professional development.

Krajick et al (2008^[2]) found that there were challenges in designing curriculum materials when working with curriculum standards. For example:

- Maude (2014^[8]) found that instruction in mathematics was well supported by wide ranging curriculum support materials (although these were not specified in the research paper) aligned to the Australian Curriculum but nonetheless resulted in superficial curriculum implementation because of poor matching between the materials and pedagogies and weak selection by teachers of materials from a very wide range. Maude (2014^[8]) and Krajick et al (2008^[2]) reported that although illustrative materials including textbooks were crucial tools, they were often of poor quality and superficial.

- Looking more specifically in the literature, Krajcik et al (2008_[21]) found that there were a few curriculum materials successfully meeting standards in the United States. In the Project 2061 review of middle school curriculum materials the materials were criticized for “covering many topics superficially,” and for “overemphasis of technical vocabulary.” The Project 2061 analyses also concluded that curriculum materials failed to consider students’ prior knowledge and did not support them in developing explanations of phenomena, with the result that they did not contribute to the alignment of the curriculum with assessment needs
- Maude (2014_[8]) also identified that new and out-of-field teachers, in particular, often lack the knowledge and time to identify high quality materials. Teachers need to put a lot of effort in reviewing and screening materials available in the marketplace. Maude noted that “many open educational resources are of poor quality.”

The timing of the development of guidance materials emerged as important in one review (Watt, 2016_[6]) because the teachers “need to have the materials” in order to be trained before they start implementing the Australian Curriculum.

Curriculum mapping or creating visual representations of alignment

Two of the reviews explored the process of curriculum mapping and the way in which this is used to clarify sequencing and making links between learning objectives, learning experiences, tasks (Schutte, McCullick and Line, 2018_[4]) and, in one case, assessment (Sekulich, 2019_[5]). For Sekulich (2019_[5]), visual representation of alignment between content and standards is particularly important for developing pedagogy and depth of understanding. He argues that a strong tool for professional learning for faculties in schools is participation in a curriculum-and-assessment alignment mapping process and analysing data on curricular expectations. What enhances the learning for all students is aligning and integrating the curriculum system and assessments system at school level.

Within the literature (Voogt, Nieveen and Klopping, 2017_[21]), there has been debate and challenges around the alignment of tools. Textbooks and assessments are inherently restrictive and limiting due to their inability to adapt quickly in response to changes in the curriculum. The misalignment caused by this mismatch between curriculum, textbook and assessments can often result in tensions and cognitive overload. Although this is the case, teachers continue to depend on textbooks within their classrooms despite the misalignment resulting in challenges with curriculum development and implementation. Some of the literature briefly touched upon ways in which technology is being used to overcome this misalignment.

The use of technology and ways in which this is being used for alignment

Within the currently climate, we are increasingly in a media-rich world which has sparked a shift to higher levels of digitalisation within education. In recent news (2019), Pearson announced that they will be moving toward a “digital-first” strategy, which strives toward creating e-Textbooks before printed copies. They explained how this would allow continuous updating of their e-textbook making it easier (and cheaper) to align material with changing curriculum, as well as providing a format that is more accessible and on-the-go for students (Glottbach, 2019_[22]).

However, digitalisation in education and its usefulness in aligning pedagogies and assessment with curriculum changes does not stop at e-Textbooks. The shift to an online

platform has resulted in the phenomenon of unbundling content, which means teachers (and students) are able to customise learning using resources such as YouTube videos and games, online quizzes, and can also track student progress. Former Education Secretary for the UK, Damien Hinds said, “Technology can be an effective tool to help reduce workload, increase efficiencies, engage students and communities, and provide tools to support excellent teaching and raise student attainment” (Glotzbach, 2019^[22]).

Research into the use of technology within the education system focusing on alignment is limited despite this being a thought-provoking topic, with the majority of the literature focusing on higher education. A paper written by Kärkkäinen et al. (2013^[23]) investigated the use of technology within STEM education using a case study from the United States (Catalyst Initiative). The study found five broad technology-supported pedagogic models emerged from the project; these were associated with gaming, virtual laboratories, international collaborative projects, real-time formative assessment and skills-based assessment. Kärkkäinen et al. (2013^[23]) and another paper investigating how additional challenges, such as monitoring teacher candidate use of evidence-based practices, can be addressed through a digital teaching platform within an undergraduate course (Bondie, 2015^[24]) explored a number of benefits to technology including:

- Facilitates real-time formative assessment and some forms of skills-based assessments that improve monitoring of student learning,
- Supports personalisation of teaching.

The literature does however explore a number of challenges/barriers to the use of technology in the alignment of pedagogy and assessment, such as:

- To adopt new models which incorporate technology require teachers to revisit their pedagogy and this may amount to the greatest cost and challenge. **The efficacy of the technology-supported models does not come from technology alone, but from the pedagogy that it supports.** Without good pedagogic resources and a good understanding of how to use technology to foster deeper learning, these models may not yield the expected outcomes.
- Adequate technological infrastructure and the availability of a critical mass of teacher-friendly digital resources are necessary, though not necessarily sufficient conditions for large-scale adoption.

1.10. What are a few examples of successful strategies and practices used by jurisdictions in aligning curriculum, pedagogy, and assessment?

According to the research reviewed for this paper, examples of countries with a strong track record of securing alignment between curriculum and assessment policies also perform well on PISA.

One review of curriculum change, alignment and impact across 9 jurisdictions (New South Wales, Queensland, Alberta, Ontario, Hong Kong, China, Shanghai, Finland, Japan and Singapore), of which all but two were high-performing based on their PISA scores (Creese, Gonzalez and Isaacs, 2016^[12]) reported that high-performing jurisdictions:

- Consistently set out clear, strong and well-thought through (as defined by the researchers) national aims and objectives.

- Use data-driven accountability measures and systems as mechanisms to direct support to where it is needed, rather than as punishments or simplistic deterrents for unwanted practices (which was more the case in the non-high-performing jurisdictions explored for comparison).
- Ensure (in most cases) that regulatory requirements cover hours of instruction mandated in general, and hours spent on particular subjects, but also create a certain (variable) degree of autonomy and flexibility for individuals or local organisations (e.g. school boards) to make choices around some aspects of this, such as curriculum time or subject provision choices.

In the Education International study (CUREE, 2019_[10]), Ontario emerges as securing alignment through relatively extensive central prescription accompanied by equally extensive, high quality written guidelines and heavy investment in developing teacher status, knowledge and skills and use of evidence. Similarly, Singapore emerges in this study as providing a good deal of central prescription and accompanying guidance alongside a range of policies for enhancing teacher status and expertise.

1.11. How is successful alignment between curriculum and assessment defined (and/or measured)? What strategies were used in countries that were successful in aligning pedagogy and assessment to changes in curriculum?

These studies and reviews do not explore how successful alignment is defined or measured and even where it is mentioned, it is described in only a light touch way. For example, Das et al (2014_[7]) suggested failures and successes in curriculum implementation, including in alignment between curriculum, pedagogy and assessment and alignment of action and policy depend ultimately on classroom practices. While students are the focus of all educational activities, teachers are responsible for implementing the curriculum, pedagogy and assessments effectively (Hargreaves and Fullan, 1992_[25]; Das et al., 2014_[7]). The paper went on to explain any policy reform in education is most effective when it is planned and implemented ‘holistically’ but also recognises that this is the most challenging way forward.

1.12. What is the documented impact of aligning curriculum and assessment on student learning?

The reforms in New Zealand’s education aimed at reducing inequalities in student achievement, improving the number of students holding a qualification, and also enhance New Zealand’s economic competitiveness were explored and highlighted as a positive impact of aligning curriculum and assessment on student learning (Philips, 2000_[9]).

Das et al (2014_[7]) defines impact through the lens of teachers’ assessment of students in the classroom. Because of the need to be aware of the purpose of the assessment, such assessment had to be a clearly aligned with the objectives and goals of the teaching and curriculum practices; these factors were proposed as being key to the quality, the process and the nature of teaching and learning. However, the evidence about practice suggested such a definition was not linked with significant, observed changes to English language assessment practice. Teachers did not use the proposed formative and diagnostic assessment, but they continued to test their students on spelling, grammar and vocabulary. A similar situation was reported in Oman with the use of summative tests promoting copying and memorisation in schools despite the enormous efforts and investments into ELE reform ((Das et al., 2014_[7]).

Sekulich's (2019^[5]) exploration of Curriculum Alignment examined the contribution of student learning and of values, distinguishing between external and internal alignment. He suggests external alignment arises when the curriculum addresses content objectives and mandated standard; internal alignment relates to how classroom assessments address the content of standards and relate to instructional strategies. He argues that the Curriculum Mapping process is successful in both contexts when collaboration and communication, both necessary components of the mapping process, are combined. Warwick (2015^[26]) also highlighted the importance of reaching consensus and collaboration and the benefits to student learning of doing so.

He argues such benefits are effectively achieved through faculty agreeing on the academic expectations for each course and grade level while understanding the relationship between such expectations and previous and future academic expectations and the curriculum mapping process is a helpful tool in this alignment process that encompasses the following:

- Alignment of the clarification of the academic vocabulary in the content for example, the vocabulary in standards;
- Creation of a visual representation of alignment by creating a matrix electronically;
- Development of a coding system aiming to represent the degree to which the content is applied and taught;
- Usage of the coding system to complete the matrix electronically;
- Analyse the finding in collaboration;
- Development of an action plan collaboratively to enhance the curriculum

The areas of alignment to be considered, according to Sekulich (2019^[5]) are vertical and horizontal alignment, the alignment of curriculum with standards, and the alignment of curricular objectives with higher levels of critical thinking.

Issacs (2014^[11]) reported that successful school systems e.g. Australia, USA, Singapore, Canada, Japan, China and Finland, adopt different approaches to aligning curriculum and assessment on student learning. Specifically:

- Australia introduced recently a national curriculum and cross-state assessments aligned to it.
- Each of the Canadian provinces have a curriculum and assessment in which it follows
- In China, Shanghai is leading on any reforms in the national curriculum before it is shared with/ implemented in the rest of the country. While exams remain the main focus and driver in student learning the shift is more towards a more integrated learning and more conceptual in China, especially in Shanghai.
- Finland has a core curriculum allowing local interpretation and school-based assessments but only until the end of high school. Then students have to take a national entrance exam in order to enter a college, meaning that the extent to which alignment of pedagogy, the curriculum and assessment is reflected in Finnish outcomes is variable depending on phase.
- Local schools in Japan can shape their teaching methods and local curriculum within the national curriculum frameworks.

- In Singapore there is a national curriculum with course syllabi and assessments, but teachers are given the room: ‘white space’ in order to adapt this depending on their local needs. Such discretion exists with the context of a good deal of guidance about pedagogy and extensive CPDL all of which is led and designed within an education system designed to emphasise coherence and so represents a building block for alignment.

1.13. What is the documented impact of aligning curriculum and assessment on teachers and teaching?

The reviews and literature have suggested a range of “documented”, though not necessarily rigorously proven, impacts of alignment on teachers and teaching, these encompass:

- Promotion of inquiry (Maude, 2014^[8])
- Development of teachers’ skills to design contextualised assessment tasks and involve learners effectively in assessment processes (Das et al., 2014^[7])
- Provision of a springboard for the development of teachers’ own ideas (Wallace and Priestley, 2017^[3])
- Opportunities to foster intellectual thinking (Wallace and Priestley, 2017^[3])
- Enhancing teachers professional learning and collaboration (Sekulich, 2019^[5])
- Aligning systems with teachers’ values shown to have positive impacts on perceived work life balance and wellbeing through the opportunity to align teaching and the curriculum with teachers’ values (CUREE, 2019^[10]).

One review conducted by Sekulich (2019^[5]), identified a study that highlighted **benefits from curriculum mapping** on teachers and on the curriculum (Jacobs, 2004^[27]). For example, he quoted a teacher as stating, “mapping has empowered me as a professional to develop a coherent curriculum for my students. I am able to design a curriculum that teaches what is really important and integrates content in a way that makes sense for kids. I can also use the maps as an essential communication tool with parents and other teachers. It was worth every minute I put into it” (Sekulich, 2019, p. 70^[5]).

1.14. What research gaps exist on using policy or other levers to align curriculum and assessment to changes in curriculum?

As noted in the methods section, curriculum, policy and assessment are complex fields to research, particularly so at the level of jurisdictions. Very few studies focus explicitly on alignment between, curriculum and assessment or curriculum and assessment and pedagogy. Each component is often developed by separate groups of policy makers/ policy initiatives. Evidence about alignment, such as it is, has to be inferred and usually emerges as part of the implementation process rather than as a focus policymaking.

In terms of coverage, we found least evidence to speak to questions about subject specific concerns) and about defining and measuring alignment between curriculum, assessment and pedagogies. The evidence here is very thin and it is not possible to do much more than simply list simple headlines or vignettes. The literature around assessment surfaced for this review in general tended to be relatively narrow in scope and oriented more towards technicalities whilst studies of alignment require, by contrast, a focus on purpose.

Thus, there may be particular challenges in researching alignment in the context of assessment.

Research about examples of successful countries in aligning curriculum and assessment) and about the documented impact of aligning curriculum and assessment on teachers and teaching and on students are also thin. The key challenge here is in surfacing documented evidence of impact. The complexities of documenting the impact of alignment between two or more very complex endeavours pose significant challenges and it is hard to see how further primary research could add useful material until jurisdictions themselves set out to undertake such alignment and do so in ways that enable and require documentation. As remarked in the sections above, there is much more that can be reported about impact drawn, through inference, from correlations. The positive findings from the two reviews of curriculum mapping seem to be the most promising avenue for starting to fill in gaps in this area, since curriculum mapping is identified by this research as helpful not only in documenting alignment but as a powerful development tool for those involved.

The evidence about what do key stakeholders do to overcome challenges in aligning curriculum and assessment is also relatively sparse. This is partly because the evidence about stakeholders is thin and because the gaps in this evidence suggest that different jurisdictions seem to focus on rather different groups of stakeholders and with very different attitudes to central prescriptions and local delegation. Since some reviews point out the importance of consultation, even, in some cases co-construction, it seems likely that stakeholder involvement may provide a promising area for additional research.

Finally, in relation to coverage, although curriculum content, implementation and alignment *as part of policy making* is not extensively researched (as far as we have been able to determine), it is nonetheless more often addresses than assessment and pedagogy as part of policy making.

Some exceptions

There is limited research about alignment in terms of the quality and depth of the evidence. Although systematic reviews provide an important degree of rigour and have been an important starting point for this review, their findings are usually abstract whilst a number of the questions important to policymakers, like those relating to stakeholders, i.e. what they do and the barriers they encounter - are fine grained and practical.

In these cases, and in the cases where the questions call for evidence about impact, the most directly relevant and useful evidence has been that which has been drawn from studies of:

- within-jurisdiction reforms to enable extensive tracing of connections between curriculum, pedagogies and assessment in significant depth; and or
- studies which undertake systematic comparison of high-level approaches which encompass or touch on curriculum, pedagogies and assessment across a limited number of jurisdictions chosen with a logic that enables consistent tracing of connections and analysis.

It may be that a more tightly focussed follow up review might be able to surface more studies of this kind.

In the Creese et al (2016_[12]) study, for example, it is possible to discern tentative patterns in approaches that may offer insights into alignment. Even so, the definitions of what is meant by curriculum, assessment and pedagogy and the accountability contexts vary so

much between jurisdictions that they have significant effects on implementation. This makes making inferences about alignment hard to draw. The implication of the evidence from this cross-jurisdictional comparison may be that what has most influence on whether curriculum, pedagogy and assessment are actually aligned in practice is the conceptualisation of the nature and goals of the curriculum, the roles of key stakeholders and the quality and depth of different approaches.

In other words, it suggests that is not so much what is done that affects alignment and quality but the ways actions designed to promote it are carried out. Another exception to the sparse nature of evidence about alignment occurs in studies of curriculum mapping which is a tool designed explicitly to enhance alignment. Curriculum mapping provides support for developing coherent sequencing which has significant implications for aligning assessment to changes in curriculum. Curriculum mapping does emerge positively in this review -but as a practice operating more at school and faculty level than as part of government policy making. A more focussed review of the evidence about use by government of curriculum mapping would be helpful and interesting if it were able to surface any studies. It is also likely to be the case that what is needed is more exploratory research and development about embedding teacher voice in curriculum development and enabling teachers and their leaders to be more discerning about the quality of assessment materials and their relationship with curriculum changes.

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