

Qualifications reforms: opportunities and challenges - a focus on A level Mathematics in England

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Overview

In the context of a rapidly changing educational landscape and fundamental shifts in the knowledge, skills and affect required for individual and societal thriving, we present an overview of the challenges and opportunities of qualification reform.

We draw on data from two studies:

- *'The Future of Assessment'* Pearson report (2021) which shows that teachers, while supportive of reform ideas in principle, are cautious about impacts that successive reforms in short timeframes may have.
- A four-year classroom-close study (2017-2021) exploring enactment and impact of reformed pre-university Mathematics A levels in England. We discuss the opportunities and challenges of the more aspirational and holistic learning targeted.
- In each case we identify 'post-pandemic' data that suggests a need for more diverse forms of assessment that more validly support valued outcomes.
- We argue for evolutionary change over time as a sustainable model for improving educational systems, building on current strengths, utilising institutional memory, and maintaining stability.

The education context in England



Diversity of institutional management and structure but high stakes assessments

Nearly all young people in England are in fulltime education from ages 5 to 18, in a variety of schools and, for many older students, 'colleges' (generically, 'centres').

There is a national curriculum for learners 5-18, nominally optional for many types of school, though mirrored in high stakes qualifications at age 16 – 'GCSEs', taken by nearly all learners.

The curriculum is narrowed after age 16, with learners who opt for academic-focused curricula usually assessed via written 'A Level' examinations. A Level outcomes for those students are typically the sole criterion for university entrance, so also high stakes.

GCSE/A Level qualifications are awarded via three national 'Awarding Organisations', e.g. Pearson.

Stakeholder, political and academic dissatisfaction with education outcomes led to reform of GCSEs with first examination ~Summer 2017, and of A Levels with first examination ~Summer 2019 (with some variation). Reforms were intended to add academic aspiration and rigour, and assessment was usually to be via terminal written examination. Short timelines in development/accreditation put pressure on timely publication of curriculum/assessment resources.

Reformed mathematics qualifications

GCSE Mathematics (age 16): more aspirational content, re-focus on mathematical communication, reasoning, problem solving

A Level Mathematics (taken by ~20% of the cohort at age 18): more aspirational content including pure mathematics, mechanics and statistics with the use of digital tools to explore large data sets; a focus on proof, problem solving and modelling.

(Also, a more aspirational **A Level Further Mathematics** - taken with A Level Mathematics by ~3% of the 'specialist' cohort, usually intending to study mathematics at tertiary level).

In each case, assessment in normal times is solely by terminal written examination papers.

During the pandemic:

- Assessment in Summer 2020 was by 'centre assessed grades': locally-moderated estimates of what learners would have been awarded under usual learning conditions.
- Assessment in Summer 2021 was by 'teacher assessed grades' assessing that part of the course covered, by a variety of appropriate (evidenced) methods.



Study 1: The Future of Assessment

(Pearson, 2021)

<https://www.pearson.com/uk/news-and-policy/future-of-assessment.html>



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Methodology

Phase 1: explored the views of over 6,000 stakeholders across the education spectrum (young people, parents, teachers, academics, policymakers and employers) including via an online public survey, polling 104 Members of Parliament and interviewing 27 Expert Panel members. Together, they provided a strategic perspective on what people want age 14–19 education to deliver.

Phase 1 explored

Purpose and Value: *the role that education should play in helping develop confident and well-rounded learners and supporting their life aspirations.*

Conditions and Environment: *how wider economic, technological, and societal trends are changing what people need to know and need to be able to do.*

Trust and Equity: *issues around fairness and coherence in the system to maintain public confidence in qualifications and assessment, and to ensure that the system serves diversity, equity and inclusion.*

Phase 2 took the findings of Phase 1 and explored more deeply what a good system should look like through literature reviews and practitioner focus groups.



Main Themes

10 consistent themes emerged among the opinions expressed. Among them we find:

- **Qualifications are valuable.** Young people want something to show for their years of learning and they want it assessed objectively and fairly.
- **Knowledge and skills are equally important** and shouldn't be artificially separated. Knowing and doing are essential prerequisites for individuals to progress in their lives.
- **Curricula should be empowering.** Young people should have access to powerful knowledge, relevant to the world around them.
- **There is too much weight on exams.**
- **Teachers want more involvement in assessment.**

Summary of Findings (1/2)

- **14–19 education should be more inclusive, more empowering and more relevant to young people's lives.**
- **Reform should be evolutionary**, building on the considerable strengths that already exist in the current system to ensure sustainability and stability.
- **Wholesale radical change is neither desirable nor needed:** substantial progress can be made by focusing on smaller adjustments.
- **National qualifications/assessments provide benchmarking of what learners know, understand and can do, and what they can build on.** They also provide exchange value that supports equity of opportunity.
- **The present system is too restrictive, precluding innovation** – and the curriculum should reflect the diversity of learners and future employment opportunities.

Summary of Findings (2/2)

Four guiding principles for qualifications and assessment emerge:

- Empowerment
- Coherence
- Adaptability
- Innovation.

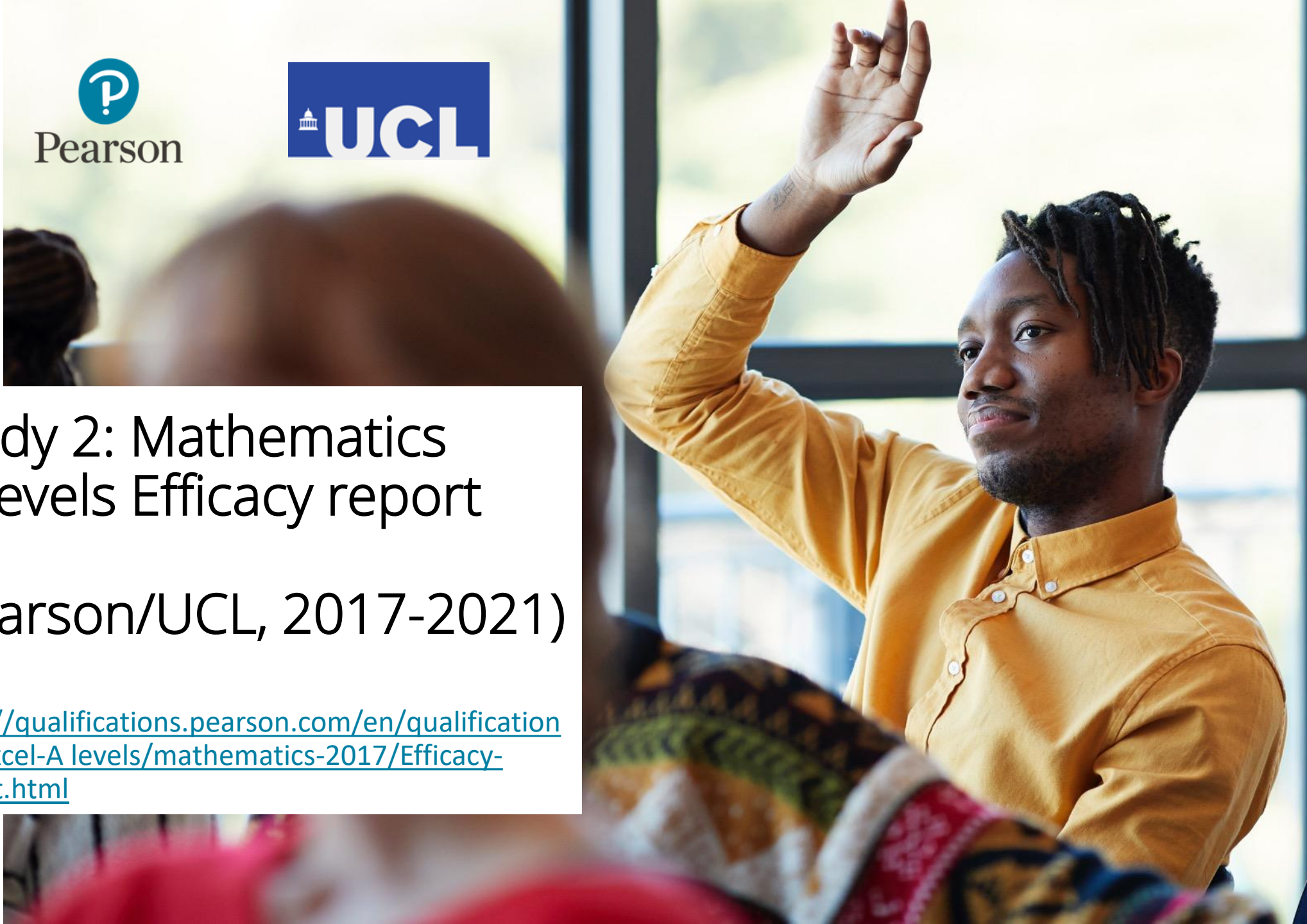
Particular recommendations include:

- Shift wholesale curriculum and qualification reform to a model of continuous, evidence-based improvement.
- Assess the right skills in the right way, enabling learners to highlight their strengths and successes.



Study 2: Mathematics A Levels Efficacy report (Pearson/UCL, 2017-2021)

<https://qualifications.pearson.com/en/qualification/s/edexcel-A-levels/mathematics-2017/Efficacy-Report.html>





Methodology

- Explores teachers' and students' experiences of reformed A Levels in mathematics (2017-21).
- From 2020 onwards, research questions adapted to also explore the impact of Covid_19 pandemic.
- Study draws on data from a fairly representative sample of up to 42 mathematics A Level classes in 21 schools and colleges, collecting termly (3* pa) surveys / interviews from students and teachers, and full semi-structured lesson observations.
- All data collection was carried out by mathematics subject specialists, ensuring nuanced and subject specific aspects of enactment could be explored in depth.
- Data included transcripts of 115 teacher interviews, 57 sets of lesson observation notes, 57 student focus groups; ~2000 completed student surveys, 166 completed teacher surveys, and progression data for ~2000 students.
- Analysis and interpretation employed a grounded, institutional ethnographic approach.
- Students and teachers offer equally valid perspectives.
- Multiple, documented steps taken to support research integrity throughout the study.



Findings (1/3)

- **Teachers were, in principle, supportive of the intentions** of the new mathematics A levels.
- **Significant challenges were created by substantial new pedagogical and subject knowledge needed by most teachers** (including around teaching for modelling, proof, problem solving and use of digital tools for exploring a large data set), and the increased depth of student mathematical engagement required, together with uncertainty surrounding assessment (Redmond et al. 2020; Mason et al. 2021). Student response usually mirrored teacher responses.
- **Our data showed that the intentions of the reforms were still not being consistently realised prior to the emergence of Covid19**, with the pandemic further disrupting this (Redmond et al. 2021).

Findings (2/3)

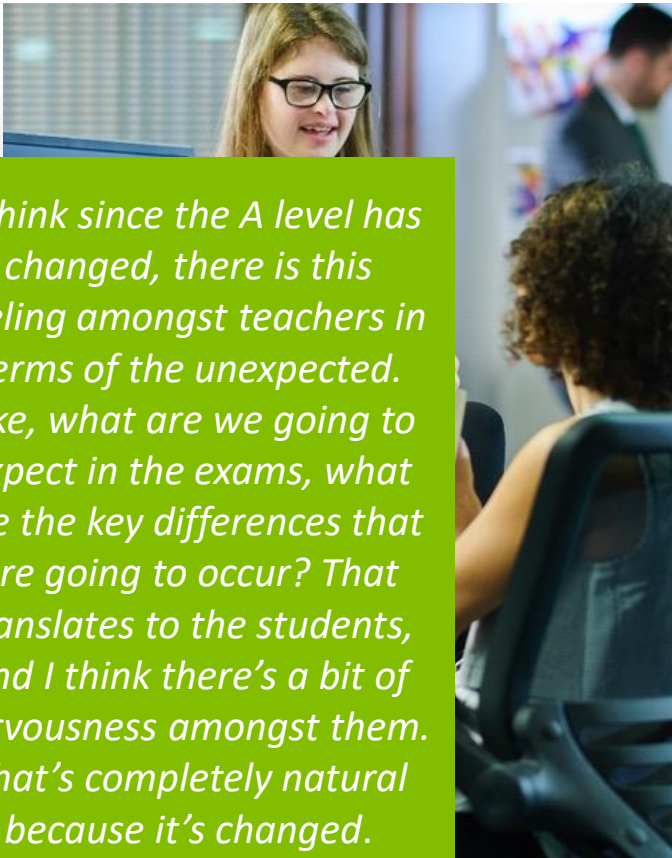
- **As the study progressed, more teachers were beginning to adapt their subject and pedagogical knowledge successfully.** Persistent concerns highlighted the importance of targeted and accessible continuing professional development (CPD) to support teachers in their transition. Most teachers said that they had accessed some level of CPD: external training or in/formal development in-centre, usually with the support of curriculum and assessment resources.
- **Over time, teachers and students drew increasingly on Pearson's curriculum resources and a variety of other (usually digital) resources,** as well as on collaborative in-centre work, to support learning. We saw more use of digital resources over time, though disappointingly little use of subject-specific digital tools.
- For students, curricular preparedness was less of an issue in the transition from GCSE than the jump in depth and extent of work needed for mathematics A Levels.
- Throughout, **teachers and students remained insecure about assessment intentions** (perceptions of 'moving goal posts') and released examination papers were often thought unhelpfully demanding.

Findings (3/3)

- **Some aspects** of the intentions, including engagement with the large data set, and problem solving, **were difficult to assess in timed written examination papers.**
- **The pandemic exposed previously under-valued aspects of terminal examinations** as catalysing conceptual synthesis and synoptic understanding.
- **The pandemic also highlighted the potential and benefits of more mixed approaches to summative assessment.**

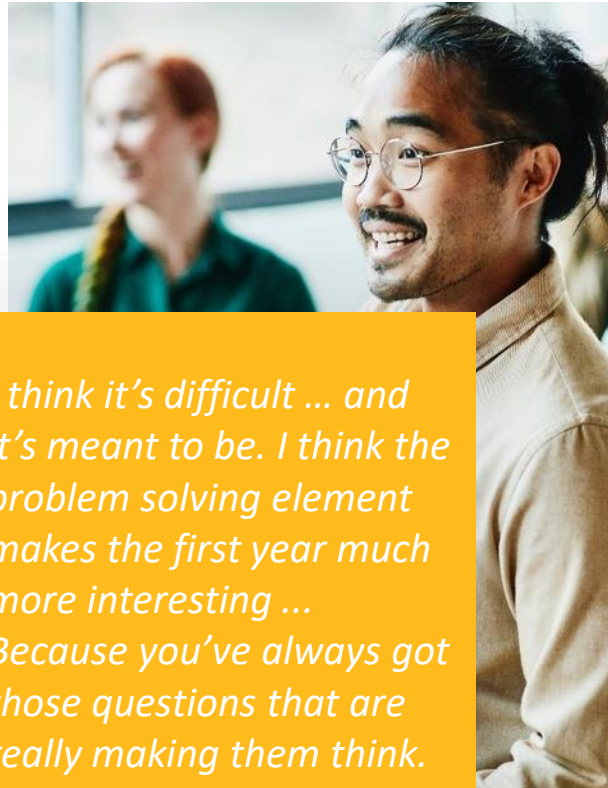
Such longitudinal, classroom-close studies at a reasonable scale are unusual. Since the majority of mathematics A level entries in England are with Pearson, these findings can reasonably be supposed to have wide applicability.

Teacher and Student Voices



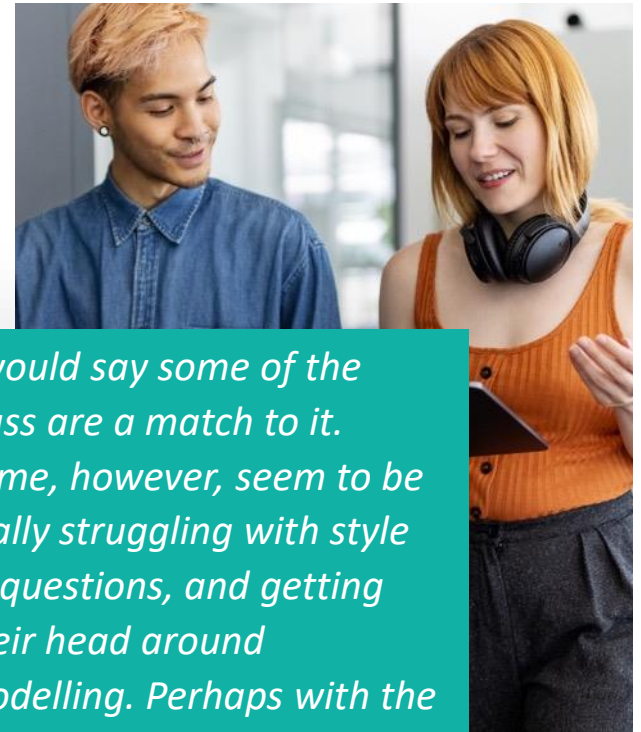
I think since the A level has changed, there is this feeling amongst teachers in terms of the unexpected. Like, what are we going to expect in the exams, what are the key differences that are going to occur? That translates to the students, and I think there's a bit of nervousness amongst them. That's completely natural because it's changed.

Centre 9, Teacher 1, Post Observation Interview 2019;



I think it's difficult ... and it's meant to be. I think the problem solving element makes the first year much more interesting ... Because you've always got those questions that are really making them think.

Teacher interview, Spring, 2019/20



I would say some of the class are a match to it. Some, however, seem to be really struggling with style of questions, and getting their head around modelling. Perhaps with the old spec they would have been ok.

Centre 5, Autumn 2018 Teacher Survey.

The methods themselves aren't too bad ... but it's figuring out when to use what'.

Student focus group,
Spring, 2019/20



We still don't really know what kind of questions will come up, and how it might be different types of questions.

Centre 10, Year 13 Student
Group, Spring 2019.



They just say be familiar with it [large data set], but what does that mean?

Student focus group,
Spring, 2018/19



Assessment Themes common to the two studies



01

There are a variety of advantages to an examination system, analysed here as a motivation for synthesising and consolidating previous work, particularly in our mathematics research, and endowing a sense of confidence that prior learning is sufficiently robust to build on and give exchange value, especially for some student groups.

However, the validity of such a system is limited, particularly with respect to some of the newer curriculum aspirations.

Centres should support students in fully valuing those important aspects of mathematical functioning that are less easy to assess through short terminal examinations.



02

A critical mass of teachers and students value examinations as impartial and endowing a well-founded confidence in progression, and preparation for them in synthesising and consolidating knowledge.

The current situation shows that teachers perceive there is considerable learning, and motivational, loss if that pre-examination synthesis stage is not engaged with.

03

There are advantages identified with more centre-informed assessments, with assessment of a wider range of mathematical functioning than is possible in terminal examinations, and with assessment that is spread over time.

It is possible that a blended approach to assessment might result in more valid and equitable assessment of students' mathematical capacities. Such combination might support more valid assessment of process-related learning





04

Impact of the pandemic appeared to be minimised where all students have access to appropriate basic technology, and teachers are both technically confident to develop their online and constrained practice, and were solution focused.

Teachers' expertise in such approaches made considerable progress over time, though that was easier to achieve with high-attaining students.

It is important to develop inclusive approaches to teacher development.

05

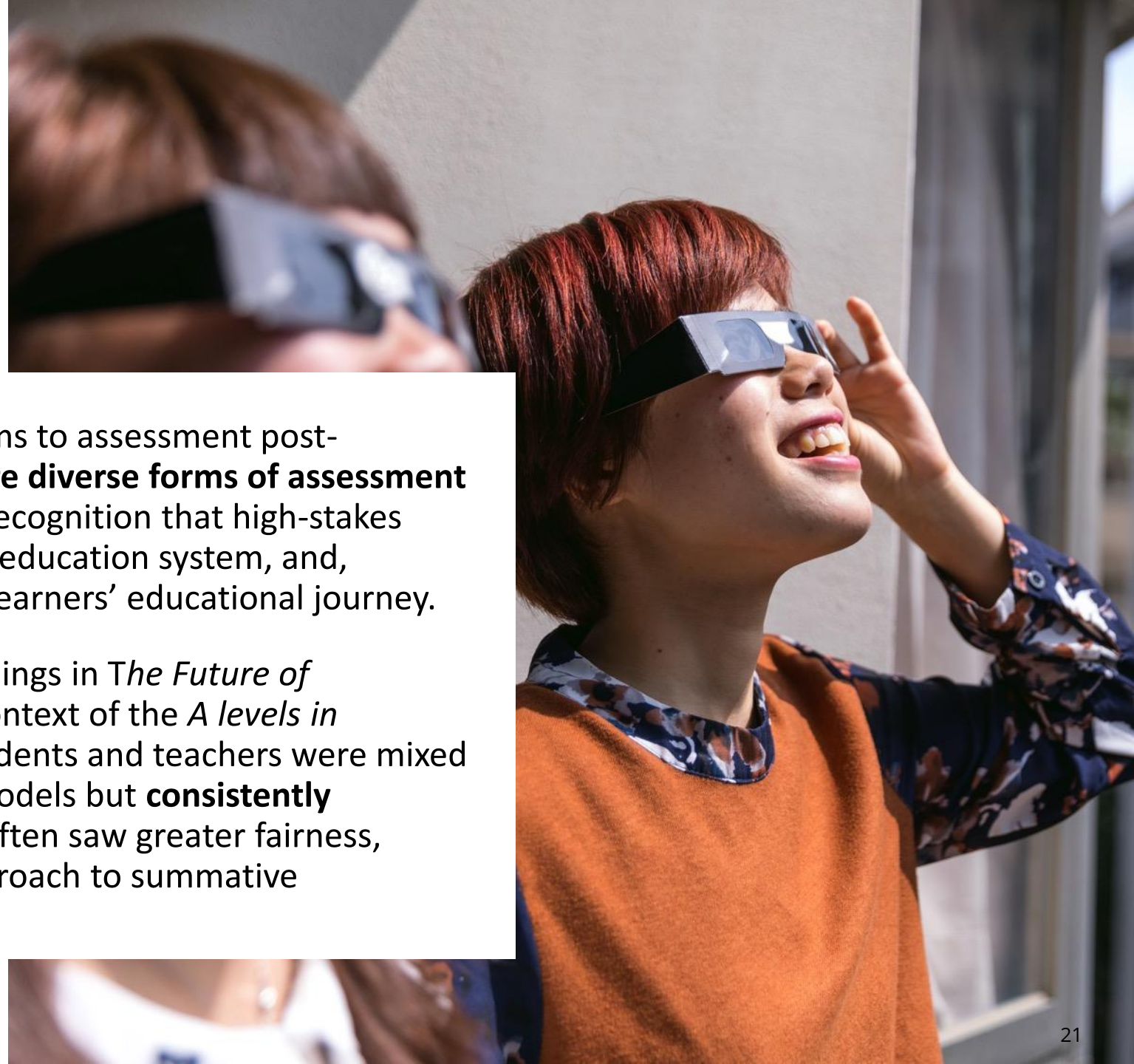
Our Future of Assessment work complementarily reinforced the need for the method of assessment to best reflect valued knowledge and skills, using technology where it adds value to the assessment experience, and placing validity at the heart of assessment design.



Conclusions (1/2)

When considering reflections on reforms to assessment post-pandemic, we saw an **appetite for more diverse forms of assessment in the future**, and at the same time a recognition that high-stakes assessments are central to the current education system, and, importantly, have a key role to play in learners' educational journey.

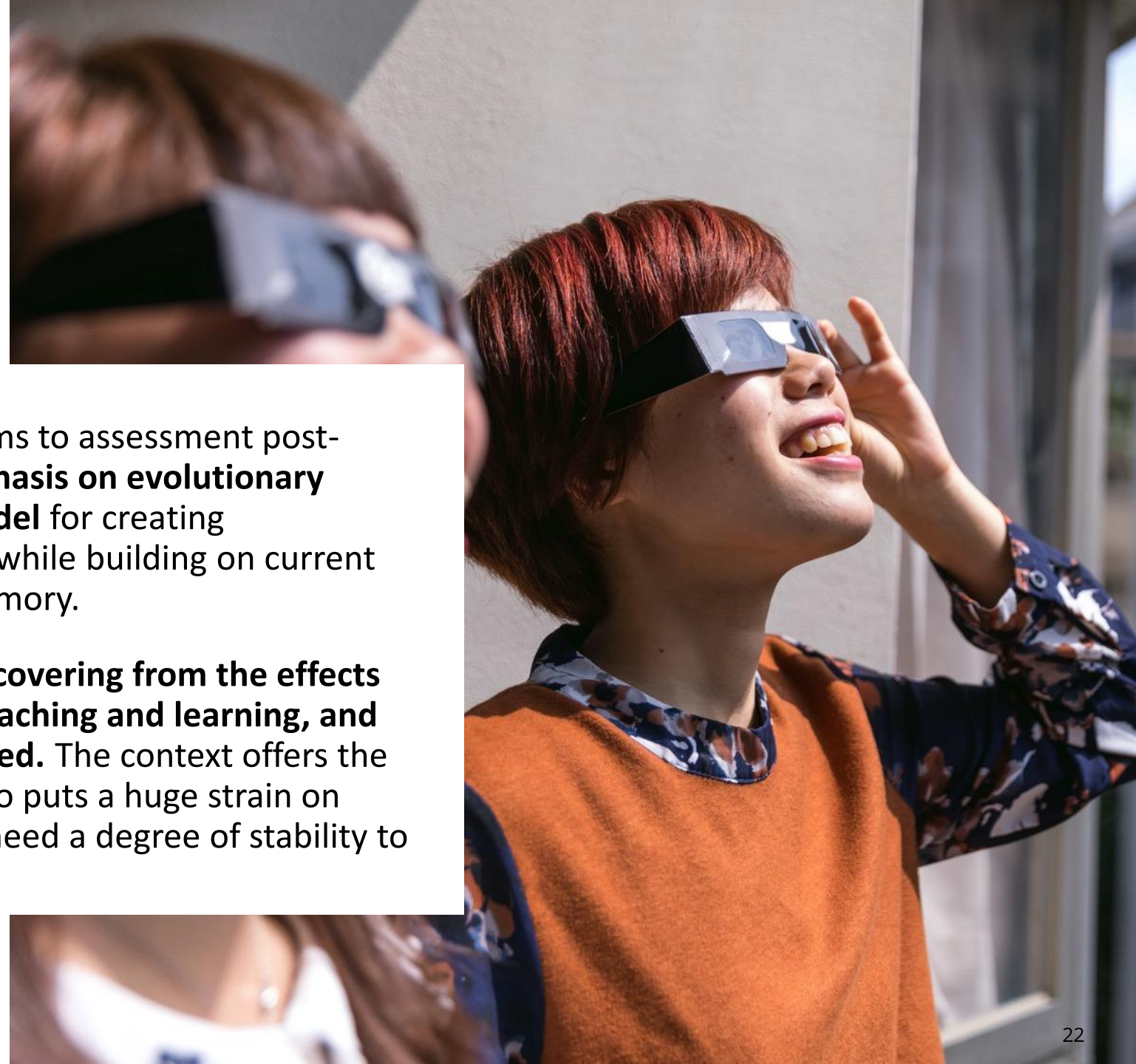
This was evident both in the broad findings in *The Future of Assessment* and in the more specific context of the *A levels in Mathematics Efficacy Study*, where students and teachers were mixed in their hopes for future assessment models but **consistently recognised the value of exams**. They often saw greater fairness, reliability and validity in a blended approach to summative assessment.



Conclusions (2/2)

When considering reflections on reforms to assessment post-pandemic, we saw an **We saw an emphasis on evolutionary change over time as a sustainable model** for creating improvements to educational systems while building on current strengths and utilising institutional memory.

Particularly pertinent when we are recovering from the effects of the pandemic and its impacts on teaching and learning, and when the status quo has been disrupted. The context offers the opportunity for fruitful change, but also puts a huge strain on education systems at all levels, which need a degree of stability to support their recovery.





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Thank you!