

Research summary

The relationship between teaching, learning and digital assessment

Summary developed by the IB Research department based on a report prepared by:

Australian Council for Educational Research (ACER)

January 2020

Background

This study examines the important digital trends that are shaping education and identifies how these trends can inform and strengthen practices within International Baccalaureate (IB) programmes. The study focuses on the evolution of digital technologies—particularly in the realm of assessment—and discusses how the IB can move into the future in a way that best balances technological advances while staying true to IB approaches to pedagogy and curriculum design. The report is future-focused, providing the IB with an overview of key considerations around how best to serve schools and enhance learning opportunities for students in IB programmes.

Research methods

The study included four main components. First, a literature review focused on pertinent trends in teaching, learning and digital assessment. The second component involved an expert review of subject and programme guides and specimen assessments across the Primary Years Programme (PYP), Middle Years Programme (MYP) and Diploma Programme (DP), in four subject areas (mathematics, science, history and language and literature). Third, researchers conducted a global cross-programme survey of IB teachers and coordinators on their experiences of, and attitudes towards, digital assessment and digital pedagogy. Also included in this phase was a series of interviews and focus groups with IB staff that covered topics around how the IB can best serve its stakeholders. Lastly, the fourth stage involved a synthesis of all data sources to identify possible forward directions for the IB.

Findings

Literature review

The literature review identified three key movements that are reshaping contemporary education:

- the notion of learning progressions and a growth mindset
- the move from formative/summative assessment to ongoing assessment
- the use of data analytics to gather data on learning.

In this context, digital tools are now commonly used for teaching, learning and assessment. There are a number of exciting possibilities in the field of assessment, including adaptive testing, the integration of artificial intelligence, the evaluation of 21st century skills, virtual reality, gamification and the use of avatars.

In terms of assessment, promising practice indicates that the learning of individuals should be made visible through the use of efficient and well-targeted tools in order to identify where learners currently are, as well as future steps for them to take. Promising practice in digital assessment suggests that digital technologies should be used to support the

achievement of this larger goal. While it may be tempting to focus on innovative approaches in digital assessment, fundamentally, assessment is a vehicle to gather useful information on learners' skills and knowledge. It is thus important that this key purpose is borne in mind when considering the viability of digital approaches.

Technological pedagogical content knowledge (TPACK)

The literature review cited the TPACK framework as a promising basis for focusing professional learning for teachers in relation to the effective use of digital systems in teaching and learning activities. This model emphasizes the need for understanding the interactions between pedagogy, content and technology in teaching and learning decision making.

Backwash and forewash

Backwash, in which the format of assessment influences teaching and learning, is a known phenomenon. Equally important, however, is forewash, in which approaches to learning and teaching influence assessment design. Learning, teaching and assessment should work in harmony, with a focus on the dynamics involved between them. There is a need for the careful consideration of support, training requirements and scaffolding, and the understanding that there is no one-size-fits-all approach.

Expert review of programme and subject guides

Experts undertook an in-depth review of IB *From principles into practice* (FPiP) documents and subject guides across the DP, MYP and PYP in the four exemplar subjects of language and literature, science, mathematics and history.

Overall, reviewers found that the mathematics MYP and DP guides, in addition to the three PYP FPiPs, provide some of the most coherent and explicit reference to digitalization through a focus on the appropriate use of ICT tools and resources and the impact on learning. These provide some good examples that other subject guides and programme FPiPs could follow.

Language and literature

In the subject guides for language and literature, reviewers found little reference to the opportunities offered by digitalization. Guides could be enhanced by mention of the affordances that digitalization can create for teaching and learning.

History

In the subject guides for history (individuals and societies in the MYP), the reviewers again found little reference to digitalization. There are opportunities to include digitalization both in terms of the topics of study as well as the approach to the subject.

Science

In the guides for science (biology and chemistry in the DP), the reviewers found little mention of digitalization other than in the DP chemistry guide, which notes the need for learners to develop “digital technology skills, which are essential in 21st century scientific endeavour”.¹ In all guides, it would be useful to explain how the core elements of inquiry-based learning can be enhanced and facilitated through digital tools and technology.

Mathematics

The reviewers noted that all of the guides for mathematics reference digitalization, albeit to differing degrees. The most recent DP guides, in particular, highlight the integral impact of technology on the mathematics courses, noting that “fluency in relevant mathematical software and hand-held technology”² is an important mathematical skill. The MYP and DP guides also include advice for teachers on how to incorporate digitalization. However, all four guides have opportunities to further reference digitalization.

Expert review of specimen assessments

Expert reviewers undertook a detailed review of DP assessment instruments and MYP eAssessment instruments across the same four subjects. The review of the DP assessment tools considered their potential for being converted to digital versions and any advantages or disadvantages this would create. The review of MYP assessment tools explored how well the affordances of digital assessment had been used to enhance the authenticity and quality of assessment materials, and identified ways in which this could be improved.

Overall, the reviewers felt that the assessment materials they reviewed were of high quality, with good and often rich stimuli which frequently referred to authentic scenarios. Nevertheless, the reviewers also noted a number of areas that could be addressed in order to enhance the quality and effectiveness of assessment materials. In particular, digital assessment design should adhere to sound principles of purpose and validity within assessment design.

Language and literature

The review of DP language and literature specimen assessments found that all items could easily be converted to an on-screen format. Advantages would include the option of both reading and listening to texts as well as enabling learners to type, and hence edit, their responses.

¹ See report Appendix 2, DP Chemistry guide, First assessment 2016.

² See report Appendix 2, Mathematics: analysis and approaches guide and Mathematics: applications and interpretation guide, First assessment 2021.

In the MYP eAssessment for language and literature, the reviewers noted the use of innovative and engaging stimuli. However, they also suggested including examples to indicate what was expected of learners in certain tasks and noted that functionality could be improved in some cases.

History

In the DP, the reviewers identified opportunities for enhancing the authenticity of tasks by providing learners with access to video or audio sources, making tasks more like something that a contemporary historian would engage with. For the MYP on-screen assessment of individuals and societies, reviewers felt that the digital opportunities had been utilized well to stimulate and engage learners in authentic tasks, with a range of item types to make marking efficient.

Mathematics

In DP mathematics, the reviewers felt that there were some potential advantages to on-screen assessment. Advantages noted by reviewers included that on-screen assessment could enable the use of authentic stimuli as well as opportunities for investigation, which could support higher-order thinking skills. With regard to the MYP mathematics eAssessment, the expert reviewers liked how the on-screen interface was used to provide learners with engaging and stimulating tasks that addressed real-world scenarios.

Science

Reviewers of the DP science specimen assessments in biology and chemistry felt that all tasks could easily be transformed into a digital mode, enabling marking to be largely automated and enhancing authenticity. In the MYP science assessment, the reviewers found that the digital environment and its associated functionality has been optimized quite well, such as through the use of interactive animations and items that call on students to calculate and identify elements or plot data from a table.

Survey of IB teachers and coordinators

An online survey of IB teachers and coordinators in all four programmes was disseminated to a sample of schools with the goal of collecting their insights into the relationship between teaching, learning and digital assessment. In particular, this survey asked how teachers define backwash on teaching and learning from digital assessment use. Overall, 2,775 educators responded to the questionnaires. The following section summarizes some of the main findings from the survey.

- 64% of respondents agree that digital assessment aligns well with the IB philosophy and that digital assessment should be included in IB programmes.
- 68% of respondents think that the use of digital assessment makes a positive contribution to the quality of learning, but 66% also report that most learners in their school would require training on how to use digital assessment tools.

- 70% of respondents report that the use of digital assessment increases their ability to monitor learner progress effectively. Additionally, however, 78% report that teachers in their school would require training and support in order to effectively use digital assessment.
- 62% of teachers in the CP report integrating digital pedagogy into their teaching in most or all lessons, compared to 30-40% of teachers in other programmes.
- Respondents are generally positive about the way in which the integration of digital pedagogy has changed their teaching. For example, 72% report that it helps them cater to a range of learning styles.
- Challenges to integrating digital pedagogy noted by respondents include a lack of resources, time management (both in preparation and in class) and the need for more training.

Interviews and focus groups with IB staff

The goal of interviews with IB staff was to supplement surveys of teachers to identify understandings of digital assessment from the perspective of those within the organization. Researchers conducted eight focus groups with IB subject and curriculum coordinators from the four subject areas as well as interviews with senior staff across the organization. Participants were asked about a range of issues, including the impact of digital assessment on teachers, backwash, the digital divide, accessibility, learner inquiry and meeting learner needs.

Overall, the focus groups and interviews emphasized the efforts being made by IB staff to balance a range of competing responsibilities as they navigate a world in which digital technologies are increasingly impacting teaching, learning and assessment. The main discussion areas are summarized below.

- While the majority of IB staff were in favour of the integration of greater digital tools in assessment, this was accompanied by significant concern to ensure that no learners, teachers or schools were disadvantaged.
- In many cases, however, staff perceived the digital divide as “attitudinal”, meaning that it related more to the perceptions of schools and teachers than to major contrasts in access to digital tools. Staff felt that the IB should “provide much more support to schools to alleviate some of the fears they have” and should tailor its support to teachers with a range of perspectives.
- One of the key issues that was brought up by IB staff in discussions was the need for approaches to teaching, learning and assessment to reflect the reality of learners’ lives.
- Many staff highlighted the possibility of assessing deeper concepts with digital assessment and emphasized that this should be an extension of what happens in the classroom.

- Staff who are directly involved in MYP on-screen assessment reported that they had seen a positive effect on teaching and learning, with teachers learning from the sample examinations and introducing an increasing amount of technology into their teaching practice. They further reported that learners are engaged in more inquiry.

Considerations

Based on a synthesis of the data collected in this study, the researchers offer a number of considerations to support and advance the IB's approach to learning, teaching and digital assessment.

1. **Learning progressions:** The IB could seek to define appropriate learning progressions in all IB programmes and subjects and explore validation methodologies for the learning progression approach.
2. **Ongoing assessment:** The IB could consider moving away from a model in which summative examinations contribute most of the final grade to an approach in which data from ongoing assessment contributes to overall performance.
3. **Data analytics:** The IB could develop an integrated system that could be linked to platforms for ongoing assessment across and within schools and enable benchmarking to better support learning. This would also enhance reporting on learner progress that could be provided to learners, teachers and parents.
4. **Psychometric analysis:** The IB could explore the applicability of psychometric approaches to strengthen future assessment practice, driven by effective pedagogy and inclusive of the ways in which IB marking is quality assured.
5. **Policy for digital tools:** The IB could establish a policy for the incorporation of digital tools across learning, teaching and assessment.
6. **Support for teachers:** IB staff could seek to identify relevant technological pedagogical content knowledge in their subjects as part of the curriculum review process. This understanding could support the development of a suite of support materials, providing teachers with suggestions, recommendations, good practice guides and case studies from other teachers.
7. **Digital assessment delivery system:** The IB could license or develop a digital assessment delivery system that is able to support a wide range of item types and to collect and make available detailed data on both student performance and the way in which students navigate the assessment tool.
8. **Optimal approaches:** The IB could strive to identify optimal approaches to learning, teaching and assessment for each subject and programme combination, ensuring sufficient consistency, but not necessarily replication, across programmes and subjects.
9. **Assessment design:** The IB could ensure that global best practice in assessment design is applied to assessment activities.

10. **Programme and subject resources:** The IB could transform programme and subject guides into a searchable digital repository that teachers and other users could navigate and that could be updated, amended and added to as educational changes occur.

This summary was developed by the IB Research department. A copy of the full report is available at: www.ibo.org/en/research/. For more information on this study or other IB research, please email research@ibo.org.

To cite the full report, please use the following:

Australian Council for Educational Research (ACER). 2020. *The relationship between teaching, learning and digital assessment*. Bethesda, MD, USA. International Baccalaureate Organization.

© International Baccalaureate Organization 2020

International Baccalaureate® | Baccalauréat International® | Bachillerato Internacional®