

Engaging Minds - State-of-the-Art Report

Dr Bilal Ahmad
Technology Lead
Ilse White
Learning Experience Lead



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

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1. Introduction	2
2. Factors Driving Secondary School Student lack of engagement or early school leaving	2
2.1 Academic and Institutional Drivers	2
2.2 Workload and Stress	3
2.3 Curriculum Rigidity and Lack of Relevance	3
2.4 Digital Distractions	3
2.5 Social and Emotional Factors	3
2.6 External and Socio-economic Influences	3
3. Current Strategies to Address Lack of Engagement	4
(As identified in WP2)	4
3.1 Monitoring and Feedback Tools	4
3.2 Collaborative Peer Systems	4
3.3 Digital Management Aids	4
3.4 Individualised Support Planning	4
3.5 Classroom Activity Toolkit	5
4. Evidence-Based Strategies from Research and Market Tools	5
4.1 Research and Evidence	5
4.2 Market Tools	7
4.2.1 Nearpod	8
4.2.2 Lumio	8
4.2.3 Formative	9
4.2.4 Classkick	10
4.2.5 Peardeck	12
4.3 Key Insights from Evidence-Based Strategies	15
5. Design Guidelines	16
5.1 Design for Limited Attention	16
5.2 Pedagogically Aligned Analytics	16
5.3 Leverage Interactive and Gamified Elements	16
5.4 Facilitate Process-related Feedback	16
5.5 Incorporate Affective Insights	16
5.6 Ensure Ethical and Low-stress Interaction	16
6. Conclusion	17
References	18

I. Introduction

The lack of student engagement and the resulting risk of early school leaving in secondary schools is not a single isolated event, rather, it is a gradual process that begins years before a student officially leaves the school. This early school leaving is driven by a combination of factors to include academic, institutional, social and personal issues. Students lose confidence when they face persistent challenges in subjects like mathematics or reading, leading to a cycle of frustration and reduced motivation. In addition, high academic workload such as overlapping deadlines, frequent tests and long school days can lead to student burnout. This is further increased due to lack of flexibility in learning pathways, where diverse students feel the curriculum lacks relevance to their future goals or personal interests. Other challenges that students face are digital distractions, particularly access to smartphones, which fragments their concentration and reduces cognitive engagement. Social and emotional factors also play a critical role in student engagement, where if they feel isolated or lack trusted relationships with teachers, they are more likely to disengage and eventually drop out. Also, external socio-economic challenges like family instability, limited access to resources and time constraints due to part-time jobs increase these risks. This report revisits these factors and highlights the current interventions and strategies used in the schools, which are part of the Engaging Minds project, along with evidence-based strategies from research and a comparative analysis of the market tools. It concludes with a set of design guidelines that can support the development of Engaging Minds toolkit during the upcoming phases of Work Package 3.

I. Factors Driving Secondary School Student lack of engagement or early school leaving

As mentioned earlier, secondary school students' lack of engagement or early school leaving is rarely the result of a single event, instead it is a gradual process of disengagement that often begins years before a student formally leaves the school. It is a combination of academic, social, institutional and personal factors. These were also identified as part of the surveys, interviews and focus groups conducted during the work package 2 of Engaging Minds.

2.1 Academic and Institutional Drivers

Students who face challenges with subjects like mathematics or reading might lose confidence which can lead to frustration with learning and attending school and a decline in motivation. Continuous low performance, missed deadlines, or delays in progression can be early signs of disengagement.

2.2 Workload and Stress

One of the key reasons for disengagement is the heavy academic workload and high levels of stress experienced by the students. If students become overwhelmed by competing deadlines, frequent tests, and long school days, it can lead to burnout resulting in feeling less engaged with school and learning.

2.3 Curriculum Rigidity and Lack of Relevance

Rigid curricula and limited flexibility in learning pathways can make it hard for learners to stay engaged, especially for students with additional needs. In addition, motivation can decline when students perceive course content or manner of learning delivery as irrelevant and not suitable to realise their future goals or interests.

2.4 Digital Distractions

Another frequently cited reason for disengagement within schools is the use of technology such as smartphones and other digital non-school related interruptions. This can cause reduced cognitive engagement leading to fragmented concentration. This in turn can slowly build up to more problematic engagement with school and learning, and issues like early school leaving.

2.5 Social and Emotional Factors

A student's connection to the school community is a very important factor for engagement. Those who feel isolated or unsupported by peers, teachers and the wider school community are more likely to consider leaving education than those students who feel included and a sense of belonging. Specifically, lack of trust-based relationships with teachers can be a major risk factor. Students who do not feel acknowledged and supported by their teachers generally experience a higher level of disengagement. Experiencing challenges with mental health and well-being is also an important factor that influences engagement. Increasing levels of anxiety, loneliness and stress can lead to or exacerbate feelings of disengagement, potentially leading to early school leaving.

2.6 External and Socio-economic Influences

Limited access to learning resources increases stress and constrains educational opportunities for students. Factors like family instability, low parental educational history or home environments where education is not prioritised can negatively affect motivation for school and learning in students. Additionally, students who hold part-time jobs may face time constraints and competing responsibilities, which can increase overall pressure on managing time and seeing

the benefits of education. This in turn increases the risk of disengagement and early school leaving.

2. Current Strategies to Address Lack of Engagement (As identified in WP2)

To address the challenges affecting secondary school students' engagement and reduce early school leaving, WP2 has identified several strategies that teachers can use to create a more engaging and supportive learning environment.

3.1 Monitoring and Feedback Tools

The Questionnaire on Teacher Interaction (QTI) compares teacher self-assessments with student perspectives to provide a unique foundation for dialogues on classroom management. It provides a unique opportunity for a nuanced, concrete and rewarding conversation about what is happening in the classroom.

3.2 Collaborative Peer Systems

Implementing peer observation routines and establishing teacher networks enables teachers to exchange best practices, share classroom management strategies, and support one another in delivering differentiated instruction.

3.3 Digital Management Aids

To reduce the fragmented concentration caused by the presence of digital technology, practical tools like classroom phone boxes can be used to manage access to mobile devices, ensuring digital technology is used only when it provides clear pedagogical value.

3.4 Individualised Support Planning

Personalised learning plans can help teachers, school counsellors and students collaboratively map out academic goals and specific support needs, making the educational journey more manageable and better supported. For example, at Tampere University Teacher Training Upper Secondary School, dedicated tutors support student well-being and motivation. At St. Joseph's secondary school, peer connection and community are strengthened through collaborative experiences such as the Student Support Team, Home-School Liaison program and student choice through Transition Year (TY).

3.5 Classroom Activity Toolkit

Projects like the Suunta initiative¹ have developed specific tools categorised by study year that focus on social skills, time management and stress reduction exercises to help students manage high academic pressure.

3. Evidence-Based Strategies from Research and Market Tools

Effective retention strategies focus on early identification of disengagement signals such as irregular attendance, declining academic performance or social withdrawal. Instead of using this data for punitive measures, schools should use these strategies to provide timely support through for example mentoring or tutoring. This section highlights evidence-based strategies including tools and dashboards, designed to promote secondary school students' engagement, as identified through academic research and exploration of existing market tools.

4.1 Research and Evidence

A recent systematic literature review of 38 studies found that learning analytics dashboards demonstrate promising effects on student participation and engagement, although limitations of methodology and small sample sizes highlight the need for more rigorous research [1]. However, it's important to note that such tools appear to have limited direct effect on students' academic achievement, motivation and attitudes.

A quasi-experimental study in German secondary schools involving students from 7th and 8th grade examined the impact of a teacher-facing learning analytics dashboard 'LA Cockpit' involving 16 teachers and 403 students [2]. Findings indicated that the dashboard helped teachers identify students experiencing learning difficulties and supported the provision of process-oriented feedback. Also, students in the experimental group demonstrated higher knowledge gains in comparison with the control group.

Another interesting study involved 35 pre-service teachers to evaluate a Knowledge-Behaviour-Social Dashboard for supporting teachers in diagnosing and intervening in computer supported collaborative learning [3]. Their findings showed that the teachers using the dashboard employed more cross-group diagnostic strategies and conducted cognitive guidance, scaffolding, positive evaluation and individual facilitation. Their conclusion was that this dashboard supported teachers to easily identify student's learning problems and provide target interventions.

¹ <https://aoe.fi/materiaali/3041>

Another case study was conducted with 1 teacher and 17 high school students to examine how ‘B-QUBE’ digital learning and monitoring dashboard influenced students’ learning behaviours and outcomes across 26 World History classes [4]. The findings showed that the teachers primarily used the dashboard to monitor and confirm class-wide learning data, supporting classroom orchestration and transitions between learning phases. Students who received more frequent teacher monitoring demonstrated significantly better post-test performance and more complex learning behaviours suggesting the potential of dashboards to enhance learning processes and outcomes.

Another related study explored the teachers’s orchestration needs when implementing technology-enhanced inquiry-based learning (IBL)² using the ‘Go-Lab ecosystem’. This study identified key orchestration needs that can be addressed by aligning learning design with learning analytics, particularly to support teachers in managing complex learning activities and uncertain student learning paths [5]. Uncertain learning paths refer to the non-linear and unpredictable ways students move through open-ended activities. Unlike traditional lessons where every student follows the same steps at once, students in IBL may jump back and forth between stages, such as researching, brainstorming and drawing conclusions at their own speed. This can make it difficult for a teacher to know exactly where each student is or if they are genuinely stuck without the help of digital tracking. In addition, this study also proposed guidelines for developing pedagogically grounded and teacher-friendly learning analytics enhanced IBL environments.

A relatively older study from 2010 conducted a formative evaluation involving 659 secondary school students examined the benefits and challenges of using Audience Response Systems (ASRs) in classroom learning [6]. Their findings showed that these systems enhanced student engagement, motivation, formative assessment and the overall learning environment. However, challenges included technical issues, resistance to new learning methods, time-related stress and low perceived performance when used for summative assessment. Students also rated these systems more positively when used for formative rather than summative assessment.

A vignette study was conducted that involved 21 in-service secondary school teachers to examine their perception of dashboards using audio and digital trace data to support monitoring of face-to-face collaborative learning [7]. Researchers in this study used an eight minute video of a real-life collaborative learning activity involving a group of students. The video imitated an authentic classroom situation where a teacher walks around the room and only

² Inquiry-based learning (IBL) is an educational strategy in which students actively construct knowledge following the methods and practices of scientists. This demands that students develop their questioning skills, make hypotheses, design experiments, and reflect on the resulting observations [5].

catches glimpses of each group's progress, rather than seeing the entire 30 minute session. After watching the video, teachers were shown the multi-modal dashboard to evaluate the students' interactions. The findings indicated that teachers perceived the dashboards as useful for monitoring, identifying students in need of support, understanding individual contributions and informing assessment. However, the study highlighted that simply providing analytics do not necessarily prompt teacher intervention indicated the need for guiding dashboards to support effective data-informed decision making. Also, one of the ethical concerns highlighted by teachers in the study was digital surveillance, wherein the constant presence of analytics devices may lead students to artificially alter their behaviour simply because they are being monitored.

In another research study, a multimodal Learning Analytics Dashboard was developed for K12 open ended learning activities to support teachers' real-time awareness of student's engagement and emotional states [8]. Their findings indicated that effective data enhanced teachers' decision making and classroom orchestration by providing deeper insights into students' learning experiences and emotional stages. However, challenges existed related to data interoperability, student privacy, increased teacher workload highlighting the need for responsible and explainable use of affective learning analytics.

Review of these studies suggest that these tools and dashboards can enhance teacher's awareness of students' learning processes, support timely and targeted intervention and promote student engagement and participation. However, the long-term impact on academic achievement, motivation and attitudes remains inconsistent. Effective implementation therefore requires pedagogically grounded, user-friendly and explainable dashboards. In addition, it's important to consider and address challenges like teacher workload, data privacy and technical complexity.

4.2 Market Tools

The current market for digital learning tools includes a growing number of platforms designed to support teachers to enhance student engagement, interactive instruction and formative assessment in secondary schools. This section reviews five representative tools: Nearpod³, Lumio⁴, Formative⁵, Classkick⁶ and Peardeck⁷. The objective is to examine how existing technology solutions support the creation and delivery of learning activities, real-time monitoring, feedback, analytics, AI-assisted content creation and integration with existing

³ <https://nearpod.com/>

⁴ <https://www.smarttech.com/lumio>

⁵ <https://www.formative.com/>

⁶ <https://classkick.com/>

⁷ <https://www.peardeck.com/>

classroom systems. The comparison evaluates platform features and key areas of differentiation. It explores how market solutions aim to drive long-term engagement and retention among secondary school students.

4.2.1 Nearpod

Nearpod is an interactive instructional platform that helps teachers create and deliver engaging, active learning experiences. It supports formative assessment, real-time student insights⁸, differentiated instruction, and interactive lessons, enabling teachers to monitor participation and learning progress. It also offers AI-enabled lesson creation and assessment tools, along with a library of standard-aligned learning resources. An interesting feature of Nearpod is Live Teacher Feedback which enables teachers to monitor student work and provide immediate, targeted feedback in real time. Teachers can annotate or add stickers to students' responses (see Figure 1), helping them identify mistakes, address learning gaps, and try new strategies. This creates a continuous feedback cycle that keeps students engaged and supported throughout learning.

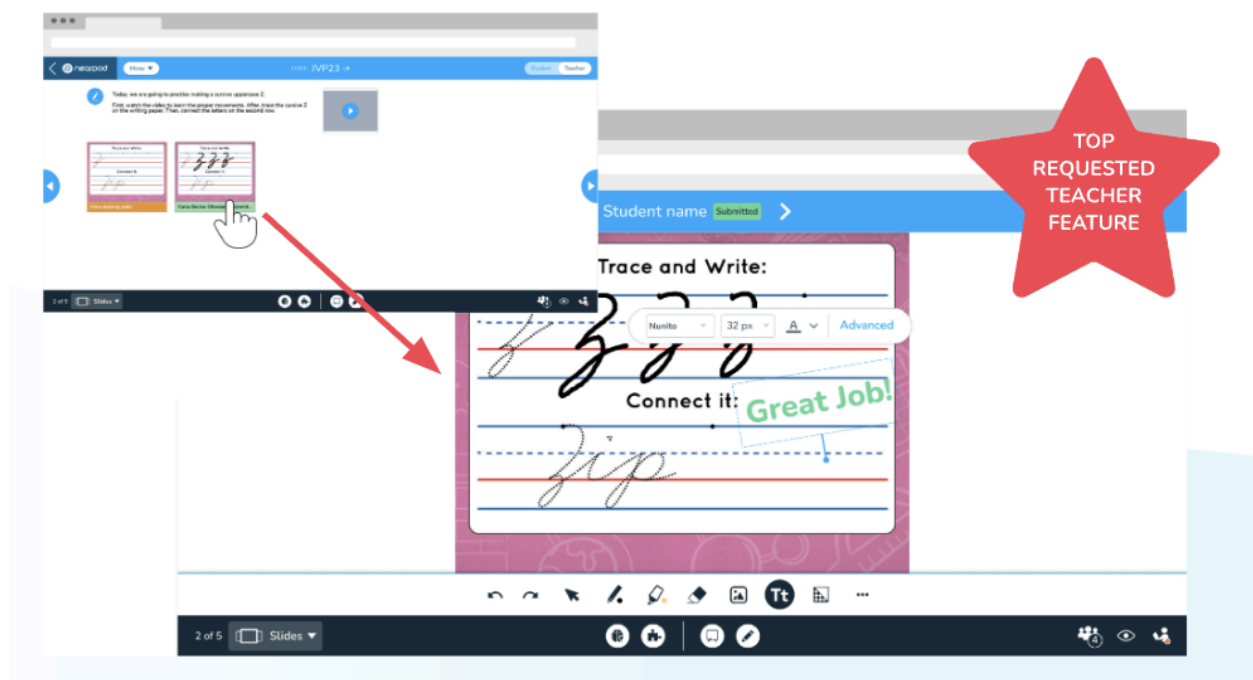


Figure 1 - Live Teacher Feedback in Nearpod

4.2.2 Lumio

Lumio is an interactive teaching platform that enables teachers to create engaging lessons with activities, games, collaborative workspaces, formative assessments and real-time feedback. It

⁸ Teachers unlocked 1.5 billion insights into student learning using Nearpod last year.
<https://nearpod.com/how-nearpod-works>

supports live and asynchronous learning, student progress tracking, and individualised feedback. Teachers can monitor each student's progress through clear status indicators, open individual work, and provide feedback directly on their handouts using text or annotations. This allows teachers to quickly identify who has started, is working, or has submitted, and provide timely, personalised support (see Figure 2). Also, its AI Assist feature helps teachers quickly generate and transform interactive learning materials, while integrations with existing tools make it suitable for K12 classrooms.

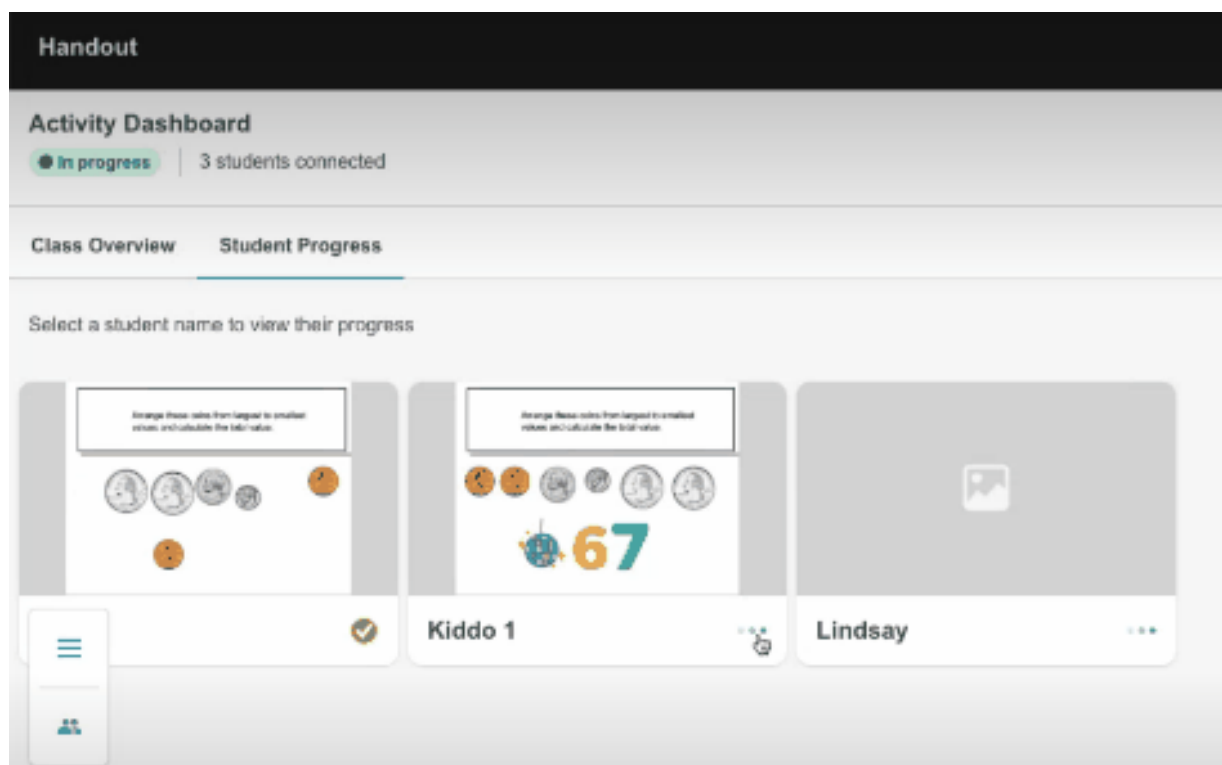


Figure 2 - Real-Time Monitoring & Feedback in Lumio

4.2.3 Formative

Formative is an AI-powered instructional and assessment platform that combines lesson creation, formative assessment, real-time students insights, and personalised feedback in one place. It provides a quick overview of student performance by showing the number and percentage of students within each score threshold (see Figure 3 for overall performance on formative assessment). Teachers can also select a threshold to view the individual students and their performance, making it easier to identify students who may need additional support. It helps teachers to differentiate instruction, track student progress, provide independent practice, and collaborate effectively. It also offers AI-assisted content creation and interactive, standards-aligned resources across subjects such as Maths, Science and Social-studies.

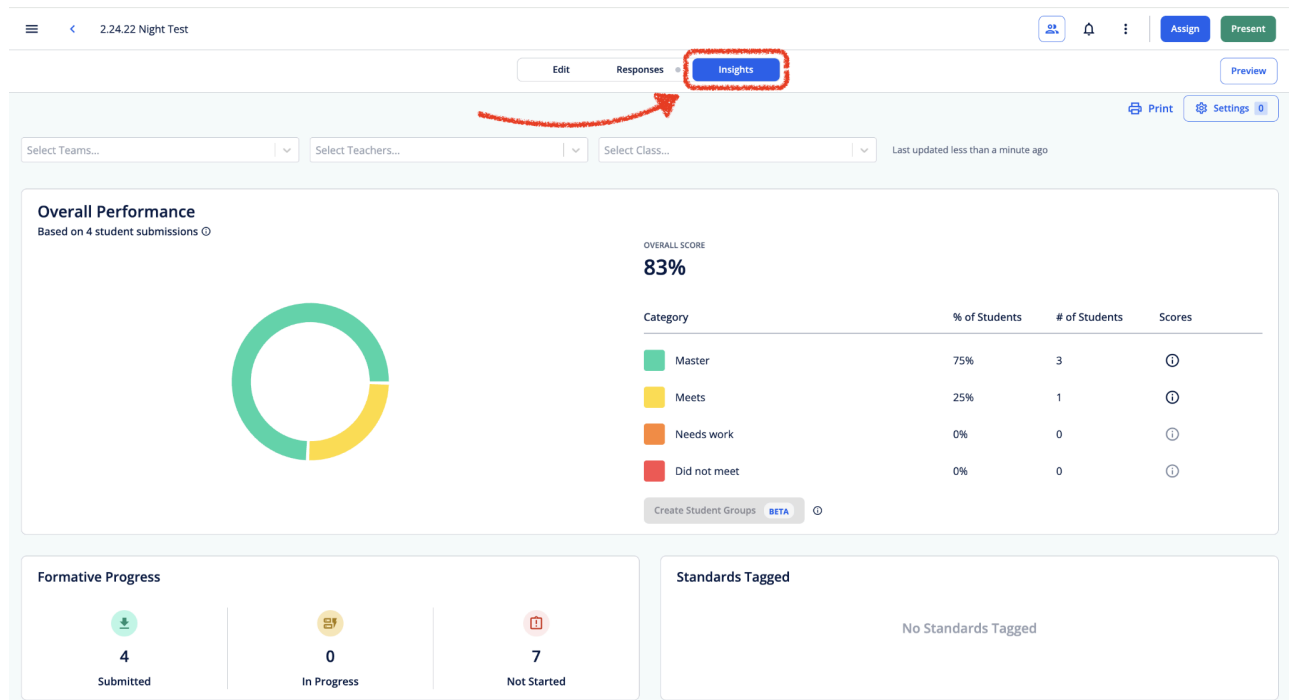


Figure 3 - Overall performance during formative assessment in Formative

4.2.4 Classkick

Classkick is a real-time learning platform that allows teachers to see students' work and thinking (see Figure 4) as they learn, identify students who need support, and provide immediate feedback. Teachers can respond directly to student work while an activity is in progress. They can use drawing, text, audio and other tools to provide immediate guidance, encouragement and corrections (see Figure 5). It works with existing lessons and supports synchronous and asynchronous learning. Classkick provides AI tools that help students overcome difficulties and assist teachers in creating curriculum-aligned assignments, while supporting differentiated and responsive instruction.

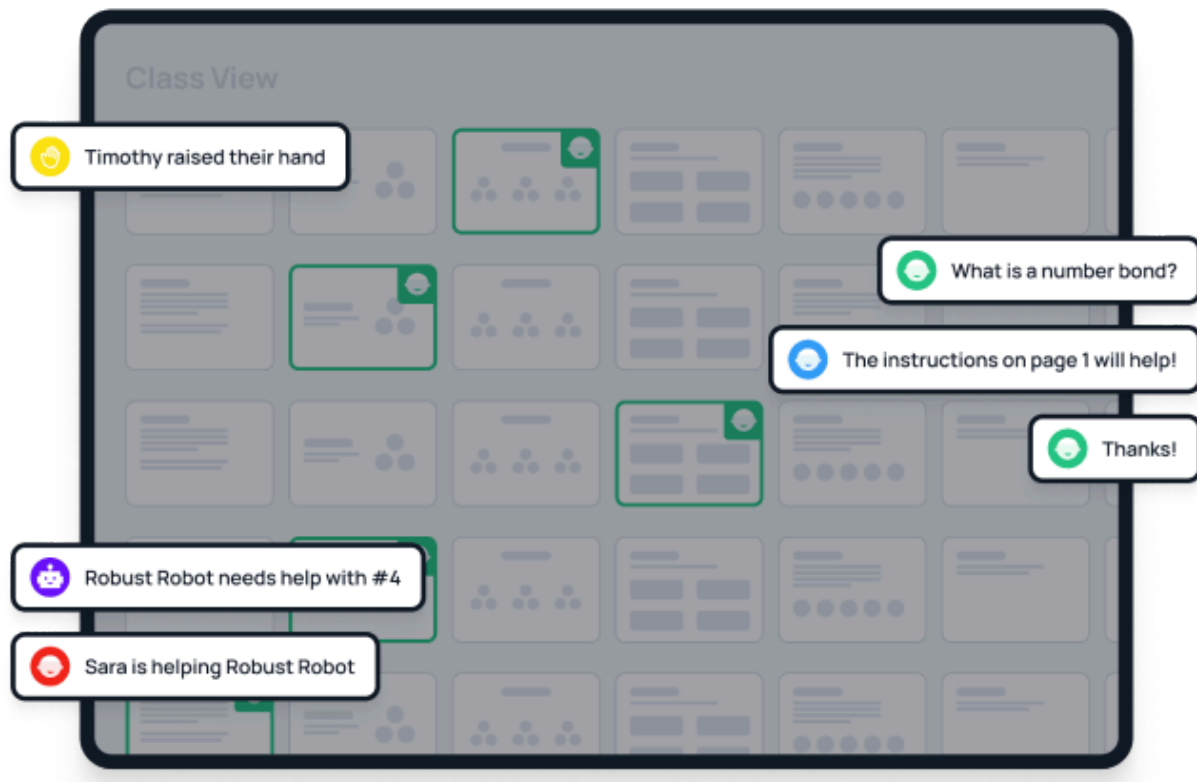


Figure 4 - View students thinking in real time in Classkick

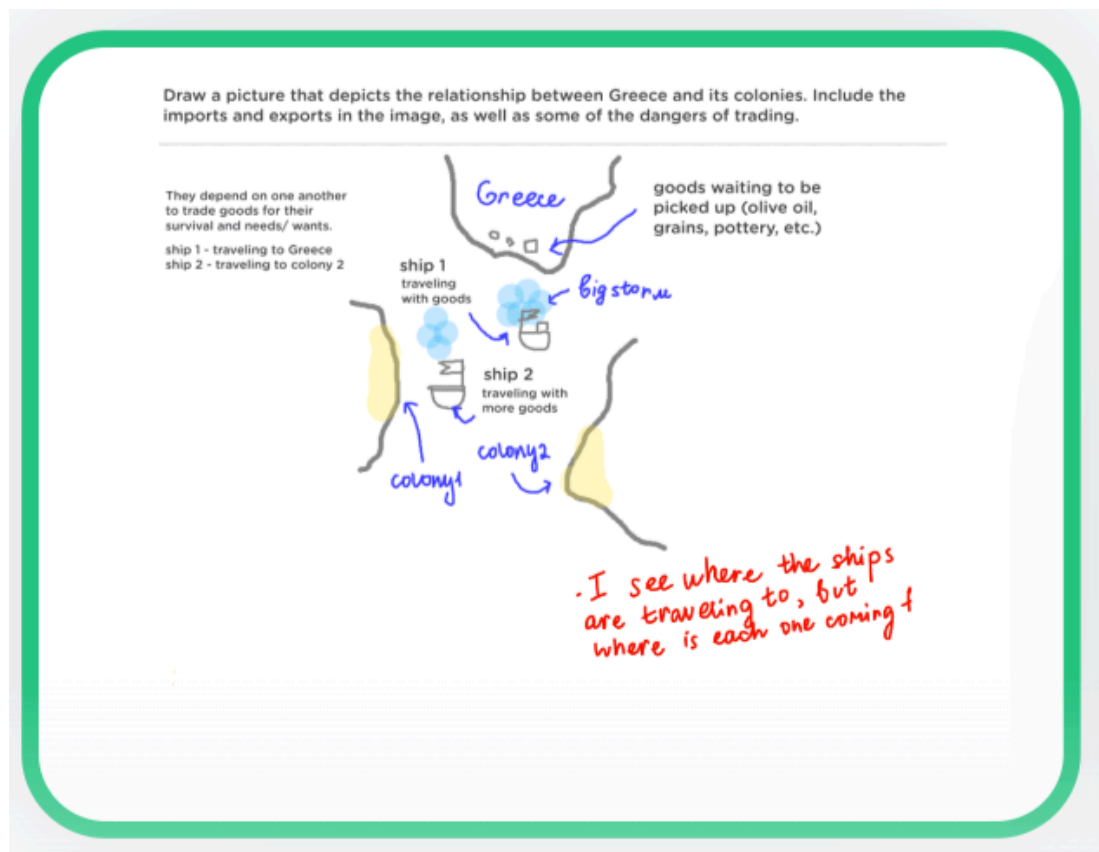


Figure 5 - Live text based personalised teacher feedback in Classkick

4.2.5 Peardeck

Peardeck is another instructional platform that supports teachers across the teaching lifecycle, from lesson planning and interactive instruction to differentiated practice and assessment. It provides real-time student feedback, actionable learning analytics (see Figure 6), standards-aligned resources and AI-powered lesson creation, helping teachers personalise learning and save preparation time. Table I further compares these tools by highlighting their focus, key features, AI capabilities and pricing.

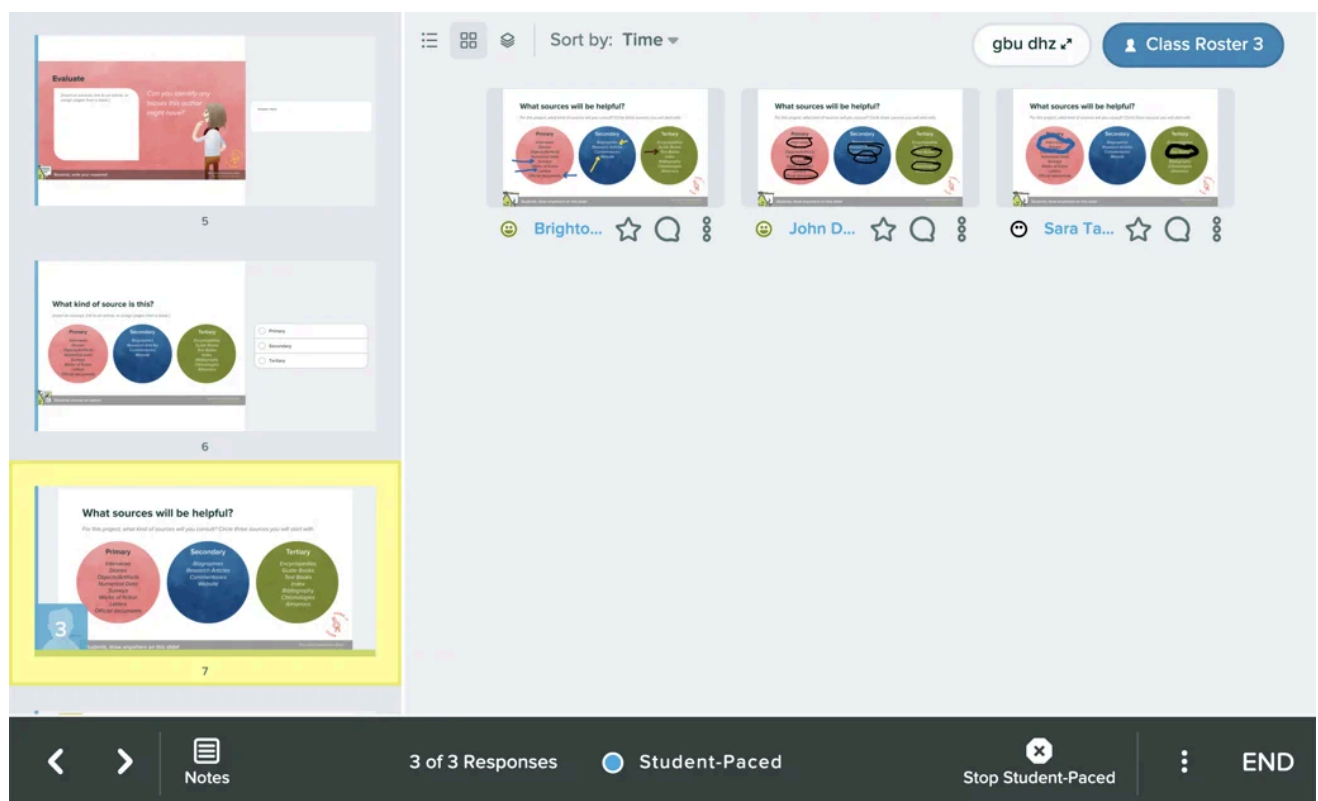


Figure 6 - Student responses real time review in Peardeck

Feature	Nearpod	Lumio	Formative	Classkick	Peardeck
Focus	Interactive instructional delivery and student participation.	Interactive teaching tools designed for student engagement on any device.	AI-first platform for instruction, assessment and real-time insights.	Real-time visibility into student thinking and instant feedback.	Supporting teachers during every instructional step from lesson planning to differentiated learning and meaningful assessments.
Key Features	Library of 22000+ standards-aligned lessons, gamification, and interactive video.	Group workspaces, game-based activities, and allows importing existing Pdf, Powerpoint slides.	Digitizing existing materials, auto-grading, and numerous question types.	Uploading Pdfs, Slides, Images, Google docs using the existing curriculum, synchronous and asynchronous learning, watch progress live and give feedback in real-time to the whole class or individually.	Gamified collaboration, real-time student feedback, assessments and test prep, interactive presentations.
AI Capabilities	AI Create for instantly generating lessons and formative assessments.	AI Assist for full lesson generation, handouts and creating quiz-based activities.	Luna AI is a built-in feature for building interactive lessons and assessments in seconds.	Several AI tools e.g. AI Create, AI Student Helper, AI Grading. AI Create for curriculum aligned assignment	Pear Start for AI-enabled lesson planning and Pear Deck for student-teacher

				creation and AI Student Helper for guidance.	interaction with interactive presentations.
Real-time Data	Post-session reports and dashboards to visualise students' understanding.	Review student work either live or asynchronously.	Instant student-response monitoring leading to improvement in instruction (e.g. timing, delivery, question type) and teacher feedback.	Live progress tracking that allows teachers to see every student's screen from one place.	Actionable data and insights, as confirmed by 8/10 teachers.
Integrations	Renaissance ecosystem and various LMS platforms e.g. Blackboard, Google classroom.	Canva, Google Slides, Duesmos.	Google Classroom, Clever, ClassLink and other major LMS/SIS platforms.	Google Classroom, Canvas, Schoology, ClassLink and other LMS platforms.	Canvas, Class Link, Schoology, other productivity tools etc.
Pricing	Free version available, quote-based for schools and districts.	Free plan available with up to 100 MB lesson storage.	Free plan available, upgrade for advanced features like advanced autograding, anti-cheating features and promoting collaboration among departments.	Free plan available for teachers with up to 10 assignment slots and limited students per month. Upgrade for more features like increased number of assignments and students, synchronizing grades etc.	Free plan available with paid plans providing advanced features like viewing and highlighting responses by name with the teacher, Reflect and Review features.

Table 1 - Comparison of Tools for Student Engagement

The market review indicates that interactive lesson delivery, formative assessment, real-time student activity monitoring and AI-enabled content creation are emerging features across learning platforms that can be used by secondary schools. Although each tool serves different purposes ranging from content libraries and collaborative learning to assessment, visibility into student thinking and instructional support, they appear to be primarily focusing on facilitating learning activities and providing teachers with information about student performance and participation. This presents an opportunity for a toolkit that goes beyond monitoring engagement to help teachers interpret changes in engagement over time, provide timely and process-oriented feedback and respond to factors that may influence student's sustained participation and retention. In addition, the use of student data requires careful consideration of privacy laws e.g. GDPR, perceptions of surveillance and cognitive load on teachers.

4.3 Key Insights from Evidence-Based Strategies

Both the research world and market are already strong at delivering interactive learning content and collecting information about student activity. However, the opportunity for the Engaging Minds project lies in better supporting teachers through interpretation of the information in a timely and pedagogically appropriate manner with low-stress interventions for already time poor teachers who work hard to sustain secondary school students' engagement and retention.

These market findings along with the research reviewed earlier, inform the design guidelines for developing a pedagogically useful, responsive and ethically responsible toolkit to promote sustained engagement in students of secondary schools.

4. Design Guidelines

Based on the review of the research studies and the market tools, a synthesis of the design guidelines is presented in this section. The aim is to use them as a guidance when developing a toolkit for promoting engagement and retention in secondary schools.

5.1 Design for Limited Attention

Dashboards should highlight student progress and learning behaviors to help teachers identify who needs support without increasing their cognitive load. Charts and icons should be presented in an intuitive manner that allow for quick interpretation during live classroom sessions.

5.2 Pedagogically Aligned Analytics

Analytics are most effective when they are aligned with the learning design, allowing teachers to interpret progress within a pedagogical framework. In addition, these tools should provide pedagogical advice and intervention recommendations to support teachers who may be new to specific methods like Inquiry-based learning.

5.3 Leverage Interactive and Gamified Elements

Use collaborative games mechanism to increase extrinsic motivation and achieve high knowledge gains in students. The activities should be interactive and related to the real-world, making the learning experience exciting and relevant.

5.4 Facilitate Process-related Feedback

Feedback should be process-related and corrective, rather than just reporting final grades. In addition, designing a tool that prompts feedback ensures that teacher attention is distributed across all performance levels, preventing low-performing students from falling behind or becoming disengaged.

5.5 Incorporate Affective Insights

The tools should disclose both ups and downs signaling high engagement as positive reinforcement and disengagement as a prompt for support.

5.6 Ensure Ethical and Low-stress Interaction

Teachers must clearly explain the purpose of data collection to students and parents to reduce feelings of surveillance and maintain a natural learning environment.

5. Conclusion

The review of research, market tools and outputs from the work package 2 indicate that while digital platforms are available that can be effective at delivering interactive content and tracking student activity, a gap remains in helping teachers interpret this data in a pedagogically meaningful way. Existing market solutions, such as Nearpod, Lumio, Classkick, Formative and Peardeck focus on real-time monitoring and AI-assisted content creation, yet the primary opportunity for further development is in providing timely, low-stress interventions to students by time poor educators. To achieve long-term engagement and retention, future technology toolkits must move beyond merely reporting final grades to facilitating process-related, pedagogically aligned feedback. This will prevent disengaged students from falling further behind. It is also important for such tools to provide affective insights, allowing dashboards to signal not just high engagement, but also high stress as a prompt for immediate support. To conclude, the implementation should be ethical and responsible and follow privacy regulations like GDPR, COPPA. This means that the data collection purpose must be clearly communicated to the students to mitigate the perception of surveillance and maintain a natural learning environment. To conclude, by aligning these tools and dashboards with pedagogical frameworks and prioritising low-stress interactions, secondary schools can create a responsive ecosystem that can support both student retention and overall well-being.

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