



Nottingham Trent  
University

Centre for Academic Development & Quality

# **FlexNTU: automated knowledge checks and formative assessment**

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## Overview

During 2020/21 we focussed on developing and delivering online content to assist in the rapid transition to online and blended delivery of courses and modules. Moving forward we want to take the opportunity to improve and enhance the way we “scaffold” the delivery and structure of that content, to increase student engagement and enhance the student experience.

The following table provides a summary of the principles of automated knowledge checks and recommendations for their deployment to enhance engagement and improve learner satisfaction, whilst improving results and better preparing students for summative and formalised assessment.

**Key Principle:** Utilise automated knowledge checks to provide regular formative assessment. Integrate short MCQ-based formative assessment following every other content chunk, which is reinforced by weekly summary formative assessment enhances student engagement and recall while preparing them for summative assessment.

Finding	Recommendation
Formative assessment after content consumption aids deeper understanding of content.	Follow key content chunks with short form MCQ based automated knowledge checks.
Breaking up content consumption with MCQs helps students maintain concentration and enhances engagement.	Embed MCQ based automated knowledge checks directly inside video content (This can be done inside Panopto video session).
Continuous weekly low stakes e-assessment enhances student outcomes and has been associated by students with increased engagement.	Integrate weekly formative assessment packages constructed of MCQs pulled from the entire week of content.
Automated knowledge checks allow academics to monitor student progress and identify problem areas without the need for extensive marking.	Utilise NOW/Panopto/Microsoft Forms to view diagnostic data or student performance during assessment.
Content-embedded assessment can increase student concentration and engagement with video content.	Longer video materials, such as lecture capture recordings, benefit from embedded automated knowledge checks. Within video content, utilise Panopto quiz tool, at 10-minute intervals, to capture concentration falls.

# 1. Introduction

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In this guidance document we will investigate the use of automated knowledge checks and formative assessment to encourage knowledge assimilation and student engagement with learning materials. The use of these techniques is designed to enhance student understanding of learning and teaching content while preparing them for summative assessment.

We will introduce the use of tools and techniques to deploy automated knowledge checks and formative assessment, and provide links to further step-by-step guidance materials to assist colleagues in the deployment and integration of these tools in their Learning Rooms.

After reviewing the different options available, we will finish by discussing some steps we could take moving forward with automated knowledge checks and formative assessment to advance our student engagement and performance metrics.

## 2. Automated knowledge checks

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### 2.1 What are automated knowledge checks?

Automated knowledge checks are a form of formative assessment often rendered via multiple-choice questions (MCQs), which are presented to the student at a designated delivery point (this delivery point can be triggered by several things, such as the completion of a piece of content or a release date arriving). Typically, the results from this assessment require little or no marking from teachers and are often immediately fed back to the student.

Using automated knowledge checks to test knowledge assimilation provides the student with the reassurance that they are learning the content they study. Data produced by these assessments is made available to both students and assessors. Students can use the feedback produced by these assessments to focus on gaps in their learning and identify areas for improvement. Utilising this early feedback allows students to better prepare for summative assessment; as such, these opportunities are generally well-regarded and perceived as valuable by students.

### 2.2 Reasons to use automated knowledge check-based formative assessment

- Breaking up content or lecture consumption with MCQs helps students maintain concentration.
- Formative assessment during and after content consumption aids deeper understanding of content.
- Testing effect or retrieval practice aids long term memory recall of learned information.
- Embedded activities during content consumption encourage engagement and enhance assimilation of content.
- Interspersing automated assessments increases learning behaviours including notetaking.
- Student engagement and satisfaction tends to trend upwards.

- Can allow academics to monitor student progress and identify problem areas without the need for extensive marking.

### 2.3 Students value formative assessment as an opportunity for feedback

Formative assessment is seen by some within the sector as 'in decline', due to time and resourcing constraints (Gibbs & Simpson, 2005), but the clarity, fairness, timeliness and helpfulness of assessment and feedback remain important metrics within Higher Education, as articulated within both the NSS<sup>1</sup> and TEF. Formative feedback is integral to a comprehensive assessment and feedback diet, and 'low stakes' assessment opportunities are vital for encouraging deep learning (Knight & Yorke, 2003) and are valued by students (Sambell, 2010). Students refer to liking online quizzes as part of their learning content, in particular showing appreciation for their informality and immediate grading feedback (Sambell, 2010). Moreover, they go on to say, "these activities help them to better understand the topics studied" (Barana & Marchisio, 2016). This is commonly understood as the 'testing effect' (Roediger & Marsh, 2005; Roediger & Karpicke, 2006), whereby "a learner performs better on a retention test after studying the material and taking a practice-retention test than after studying the material twice" (Johnson & Mayer, 2009). The testing effect has been borne out within research, e.g. McDaniel et al's 2011 study demonstrating the efficacy of low-stakes quizzing in promoting learner retention of course content. There is an appetite for mechanisms by which to integrate sustainable, effective and embedded formative feedback within learning and teaching (Sambell, 2010).

### 2.4 Students value online MCQ-based testing

Low stakes continuous weekly e-assessment has been found to enhance student outcomes and has been associated by students with increased engagement (Holmes, 2015). Completing low stakes assessments, such as MCQs, online has been found to be preferred by some students because it can be less stressful, easier to access and submit, and allows for immediate feedback and grading opportunities (Holmes, 2015: 6). Consistent MCQ testing over the course of a module has been shown to have a statistically significant correlation with higher examination performance, suggesting that this approach has both experiential and academic benefits (Einig, 2013).

## 3. Examples of deploying automated knowledge checks

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### 3.1 Content-chunking and MCQs

Content "chunking" refers to the strategy of breaking down content into bite-sized pieces so the brain can more easily digest new information. George A Miller first coined the content chunk concept in 1956 with his theories of "working memory". The basics of working memory were simplified into the concept that the brain could only hold seven, plus or minus two, pieces of new information at a time. Modern neuroscience techniques have since refined our

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<sup>1</sup> In the 2020 NSS, NTU scored above the sector average for questions relating to assessment and feedback.

knowledge of the human brain and our learning patterns to further advance our understanding of how we learn and how our brain assimilates information. Content chunking allows us to strategically produce more efficient learner compatible resources designed for long term retrieval.

A strategic deployment of automated knowledge checks, or formative assessment, combined with content chunking would be to roll out MCQ-based assessment after a content chunk to reinforce assimilation. This would expose learners to new concepts and knowledge and then immediately give them an opportunity to recall that information and reinforce their understanding and learning.

**Content chunk automated knowledge check strategy:** Consider utilising short form MCQ-based automated knowledge check after each key content chunk with 3-5 MCQs. It is important not to bombard the student with too many questions in a short span of time where the negative experience of getting questions wrong can outweigh the positives of getting questions right. These regular low stakes formative assessment sessions with larger weekly automated knowledge checks. These should be composed of questions from the entire weeks content to allow the student to reflect and recall the information learned.

Content chunking is the one of the primary drivers for FlexNTU's recommendation to limit video content size to under **10 minutes per video** in order to maintain student engagement and optimise the learner experience.

For more information on the creation of chunked video resources please see principle 7 of the [Online Learning Principles PDF document](#).

For video content which, by its very nature, requires longer segments and cannot be vignettted into smaller separate videos (for example, recordings of live performances or sporting events), we recommend the use of "time stamping" to effectively chapter your content. Chaptering is a useful way of breaking up the topics being discussed, allowing for ease of viewing and enhanced engagement, as well as enabling users to take breaks, effectively resetting and refreshing the learning focus. Chaptering is a non-damaging method of partitioning video content, which preserve a single video file with time-stamped bookmark acting as chapters for navigation purposes, and is distinct from content chunking.

*Useful links for guidance on deploying MCQs and formative assessment tools online*

### **NOW Assessment Tool Guidance**

MCQs created in the assessment tool can be contributed to a question bank for use in other assessments and randomised.

[Creating multiple choice quizzes in NOW.pdf](#)

Standard guidance on creating and deploying MCQs in NOW ([Quick-Start Video version](#))

[Assessment builder experience in NOW.pdf](#)

Guidance on using the new "Assessment builder" environment to create quizzes and assessments in NOW

### **Microsoft forms MCQ Guidance**

A more informal tool some may find faster and more familiar to use if comfortable with

spreadsheets and the Microsoft ecosystem.

[Creating quizzes using Microsoft Forms](#)

### 3.2 Embedded MCQs

At Nottingham Trent University we provide pre-recorded lecture content for On Demand delivery; this allows for a flexible delivery approach but for information-dense subjects can lead to a passive transmission of knowledge model, requiring little engagement from students. We know that students can learn in deeper and more effective ways when they are actively engaged learners rather than passive receivers of information (Laurillard, 1993 in Frick et al, 2020; Moulding, 2010). Changing to a more “student-focused teaching strategy that includes activities to engage students during the lecture enables students to enhance their understanding of content” (Frick et al, 2020).

A simple and effective way to achieve this with pre-recorded lecture content would be to break up section or chapters of content with embedded MCQ assessments. Panopto allows users to embed multiple choice questions into their videos. The video will pause, and the question/s will be presented to the viewer to be answered. We would recommend an MCQ-based intermission for every 10-minute content chunk. This intermission may only include 1 or 2 questions to afford the student an opportunity to reflect on the information they have been reviewing. The Assessor can view statistical information and data regarding the number of users who answered correctly, to gain an insight into students’ progress and identify any problem areas in the content which may need to be addressed via cohort feedback.

#### Panopto Guidance Materials

[Using Panopto to create and host video resources](#)

[How to Add a Quiz to a Video with Panopto \(Video Resource\)](#)

## 4. Taking automated knowledge checks further: peer assessment.

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Given the positive association between student engagement and academic performance, institutions constantly look for ways to increase student engagement with the learning and teaching process. It is possible, with the use of assessment tools, to allow students not only to be assessed by automated means but to allow them to create new questions to contribute to the question bank. Actively participating in the creation of MCQs has been identified as an effective way of enhancing student learning (Grainger et al, 2018; Walsh et al, 2018; Kurtz et al, 2019) and can contribute to student engagement.

Existing tools on the market such as “PeerWise” allow students to create their own multiple-choice questions which are contributed to a pool, and can be answered, rated, and commented on by their peers. This process is wrapped inside a gamification system which issues awards in the form of ratings, trophies, and feedback, actively encouraging increased participation beyond the required engagement level from students.

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