**Research article**

# The multiple dimensions of curriculum mapping: designing a comprehensive outcomes-based framework

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## Abstract

In curriculum design processes, the principle of constructive alignment represents an effective tool for aligning curricula, pedagogy and assessments to make curriculum content explicit. Yet there remain gaps in the achievement of constructive alignment in higher education. Curriculum mapping processes attempt to map the vertical and horizontal alignment between modules and courses; however, as we argue in this article, there may be gaps in these processes such that full constructive alignment is not adequately achieved. In this article, we present a framework that identifies all connecting relationships between module and course learning outcomes as required for comprehensive constructive alignment. The framework serves to highlight where these gaps (or what we call fracture points) may occur that are not adequately addressed by curriculum mapping processes. The utility of this framework comes not only in offering insight into the contributory roles of learning outcomes and constructive alignment processes (and thus providing the opportunity to reflect and address disparities that may

lead to curricular misalignment in higher education); it also provides more coherence in approaches to understanding the *why* of learning outcome design.

**Keywords** curriculum mapping; constructive alignment; learning outcomes; fracture points

# Introduction

In curriculum design processes, attention is often drawn to the principle of constructive alignment between artefacts, such as syllabuses, assessment methods and other resources (Biggs and Tang, 2011; Colby et al., 2011) and learning outcomes that bring focus to how and what students are to learn (Biggs and Tang, 2011; Biggs et al., 2022). However, as well as stakeholders not always being involved in learning outcome design to ensure that their needs are represented, a further challenge arises, given the possibility of differing interpretations of the same learning outcome by different stakeholders (Ackerman et al., 2003; Caza et al., 2015; Howard and Warwick, 2013), in addition to differing expectations about what should be included as learning outcomes (see also, for example, Scott, 2011). Curriculum mapping therefore attempts to address the gap in the design of learning outcomes and to create a more coherent curriculum by making explicit what is taught (content and learning outcomes), when it is taught and the assessment methods to demonstrate achievement of learning outcomes (English, 1980).

Yet we argue that there are potential gaps in curriculum mapping processes, particularly in higher education, where there are increasing interconnections of different disciplines, and where the relationships between module learning outcomes (MLOs) and course learning outcomes (CLOs) are not always clear-cut. Indeed, much of the literature on learning outcomes does not even distinguish between these two levels. In our analyses of these dimensions of alignment, we use the term *fracture points* (Bird and Pratt, 2004) to describe these gaps that, if not resolved (or 'repaired'), may lead to curriculum misalignment. Such fractures can be actual, resulting from improperly aligned learning outcomes with assessment and content (Biggs and Tang, 2011), or perceived, resulting from a lack of understanding of learning outcomes (Costigan and Brink, 2015).

We conceptualise a curriculum map in higher education as a more complex matrix of relationships between modules at the same and different levels of study. Unlike static processes implicit in constructive alignment and curriculum mapping processes, this conceptual matrix needs to be dynamic: not only should modules align when designed, if one element is later changed, other elements may also need to change to maintain full alignment, therefore addressing potential areas of misalignment before they occur. To develop this framework, we therefore seek to answer the following question within this research: What are the multiple dimensions in a constructively aligned outcomes-based framework?

The article proceeds as follows. First, we briefly explore key literature to understand the nature and meaning of constructive alignment, curriculum mapping and the key features of learning outcomes in design and application (at both module and course levels). We then discuss our approach to this research, and subsequently the research findings, including formulation of the comprehensive constructive alignment framework that captures the relationships between learning outcomes for perceived full constructive alignment. We then demonstrate the applicability of the framework with reference to one course from a UK business school to illustrate the relationships between learning outcomes as presented in the framework. The MLOs and CLOs for the selected course are unpacked, and the conceptual framework is designed based on the existing alignment between MLOs (at the same and different levels of study) and CLOs. Based on our analyses of the data, we further include relationships in the conceptual framework where alignment should exist but are not necessarily addressed in curriculum mapping processes. The final section discusses the main implications of this research, and contributions to the literature on curriculum design.

# Review of the literature

The principle of constructive alignment is based on a constructivist theory of learning (that students actively construct their own knowledge and understanding), and it thus seeks alignment between

syllabus, pedagogy and assessment tasks (Biggs and Tang, 2011). This principle is linked to the concept of *outcomes-based education*, a model increasingly adopted globally, which is defined as 'starting with a clear picture of what is important for students to be able to do, then organizing curriculum, instruction, and assessment to make sure this learning ultimately happens' (Spady, 1994, p. 12). This constructive alignment between learning outcomes and assessment is crucial, as it ensures that students are achieving the required learning outcomes while preparing for the assessments (Biggs, 1996), rather than focusing only on the elements of the curriculum that will be assessed.

## Learning outcomes and constructive alignment

Learning outcomes within an outcomes-based model describe 'what learners should know, understand and be able to do on the basis of a given qualification' (Biggs and Tang, 2011, p. 8), make explicit what is in the curriculum, and serve as 'a critical intermediary link' (Costigan and Brink, 2015, p. 261) between stakeholder expectations and curriculum development. These stakeholders include: students; teaching faculty, who design and teach on the modules and courses; businesses, who are typically employers of graduates; and professional bodies, who regulate or otherwise oversee graduates and their employment, and thus provide a connection between graduates and employers. Higher education institutions adopt different labelling conventions to refer to the building blocks of study. In this article, we use the terms *course* to refer to the overall programme of study, for which the final graduating award is made, and *module* to refer to the individual blocks of study that are typically each assessed individually, but which, jointly, make up the course award. The design of learning outcomes is typically made at three levels (Biggs and Tang, 2011): institutional learning outcomes (ILOs) specify the attributes that graduates of a given institution should possess from studying a particular course; CLOs specify the knowledge, skills and attributes gained from studying a particular course; and MLOs specify attributes for an individual module. (In some parts of the literature, ILO stands for intended learning outcomes. We do not use ILO in this sense, principally because this term fails to distinguish between the module and course levels which, we argue, is central to the process of comprehensive and clear constructive alignment design.)

In what follows, we focus on MLOs and CLOs as being the principal information provided for stakeholders, most notably students, and developed within teaching teams. Further, at the course level, broad learning goals describe the expectations, without always providing strategic guidance (or indeed impact) on possible approaches to teaching, learning and assessment (Hadjianastasis, 2017) at the module level. Additionally, there are possibly diverse stakeholder interpretations of CLOs – which may be influenced by sociocultural, intersectional and political contexts (Ioannidou and Zarifis, 2024) – which have an impact on how these outcomes are understood. Tensions can also arise between dynamic, learner-centred curricula and a static, tightly defined outcomes-driven framework (Hussey and Smith, 2002) that leads to oversimplification and the reduction of complex educational goals into an administrative check-box exercise (Loughlin et al., 2020).

Constructive alignment is intended to reflect not only the links between the syllabus, pedagogy and assessment on a given module, but also how they connect with the syllabus, pedagogy and assessment on other modules, via the multiple potential linkages between CLOs, MLOs and ILOs. Biggs and Tang (2011; see also Herbert et al., 2009) proposed a constructive alignment approach to an outcomes-based education environment, describing it using action verbs:

> In constructive alignment, the intended learning outcomes are written to include an activity, not just a topic: for example, to explain a particular concept. That activity, explain, is then specified in the teaching context so that it is activated in order to achieve the outcome. Likewise, that activity, explain, is specified in the assessment task, to ascertain if the outcome has been achieved and how well … The alignment is achieved by ensuring that the intended verb in the outcome statement is present in the teaching/learning activity and in the assessment task. (p. 98)

Biggs and Tang (2011) go on to refer to 'constructively aligned teaching [which] systematizes what good teachers have always done: they state upfront what they intend those outcomes to be in the [modules] they teach – always allowing that other, unintended but desirable, outcomes will emerge that they may not have anticipated' (p. 99). The significance of this definition is that while constructive alignment will typically be operationalised at the module level, the basic principle should also apply at the course level; however, this can only be assured through alignment between CLOs and MLOs. In practice,

therefore, constructive alignment requires the alignment of multiple elements, insofar as a course is studied cumulatively, via multiple modules. Constructive alignment processes that occur in this complex matrix, however, have been described as somewhat of a *black box* (Barnett, 1988) between students' entry and exit points, as the meaning and value of the learning outcomes themselves are often unclear.

The achievement of constructive alignment therefore has its limitations and challenges. For example, while constructive alignment addresses *what* students are to learn for the achievement of learning outcomes and *how* learning progress is assessed, the what and the how of learning outcomes are not always aligned and integrated into a coherent whole (Whetten, 2007) at both module and course levels. Further, even if the what and the how are aligned, this does not set out *why* modules and courses are designed as they are. Specifically, constructive alignment does not necessarily explicate the why in the selection or design of learning outcomes within a module or course, such that their meaning is communicated to, and correctly understood and interpreted by, all stakeholders, particularly students. Indeed, Loughlin et al. (2020) discuss the tensions arising from the practical implementation of the theoretical constructive alignment framework, suggesting that constructive alignment can and should serve students as a tool for effective learning rather than as an institutional administrative validation of teaching quality.

While constructive alignment does not automatically explain the why in the selection or design of learning outcomes within a module or course, curriculum mapping processes are an attempt to explain why modules and courses are designed as they are, such that their meaning is communicated to, and correctly understood and interpreted by, all stakeholders. Curriculum mapping thus aims to make the curriculum more transparent to all external and internal stakeholders (including students, faculty, accreditation agencies, and the external business community as a major employer of graduates), and to help demonstrate the links between the different parts of the curriculum (Harden, 2001). Moreover, as shown by Roßnagel et al. (2021), effective communication of constructive alignment at what they call the 'course' level – our 'module' level – encourages students to greater efforts at deep learning. Being clear on constructive alignment can have significant benefits for student learning and outcomes (see also Das, 2021). Those elements that promote active learning are particularly important (Hailikari et al., 2022).

## Curriculum mapping

The curriculum map has been described as a method of operationalising outcome-based education for determining whether the curriculum meets standards and aligns with learning outcomes (Harden, 2001) and to help set out the learning journey in advance (Jacobs and Johnson, 2009). Curriculum mapping is therefore intended to create a visual representation of the curriculum based on real-time information (Jacobs, 1997) to help reveal any gaps or areas of overlap in the curriculum (Archambault and Masunaga, 2015), and thereby to promote a deeper understanding of the curriculum and learning outcomes (Harden, 2001). Although curriculum mapping processes typically occur at primary and secondary school levels (see, for example, English, 1980), the processes are increasingly adopted for use in higher education.

In examining curriculum mapping in higher education, Uchiyama and Radin (2009) describe it as a cyclical process consisting of five stages: (1) mapping modules by individual instructors; (2) aggregating the maps by the instructors horizontally; (3) reviewing all of the maps in a course by all faculty vertically; (4) identifying areas in need of alignment and revision; and (5) implementing the changes. At the module level, the curriculum map may describe what is happening in the curriculum – that is, the learning outcomes, the content and approaches to assessment for the learning outcomes. This constructivist approach may also be adopted at the course level, where modules (including assessment tasks) are aligned to specific CLOs. The curriculum map can therefore help identify any gaps or overlaps in the curriculum and seeks to facilitate a common understanding among faculty of the role that each module plays in achieving the objectives of a course (Gilbreath et al., 2016). Jacobs (2004) further describes success in curriculum mapping as the achievement of two specific outcomes: a measurable improvement in student performance; and the embedding of mapping within curriculum design processes.

Curriculum mapping processes in higher education, however, are often aligned to assurance of learning (AOL) processes that describe the vertical alignment between ILOs, CLOs and MLOs, and are usually constructed as part of external accreditation processes. External frameworks in higher education include benchmark statements by the Quality Assurance Agency for UK higher education, and requirements by external accreditation agencies and professional bodies. Such processes can also be used for institutions' internal quality assurance (Jingura and Kavenuke, 2025). The accreditation agency,

the Association to Advance Collegiate Schools of Business (AACSB, 2019), broadly states what AOL processes are used for:

> Schools use assurance of learning to demonstrate accountability and assure external constituents, such as potential students, trustees, public officials, supporters, and accrediting organizations, that the school meets its goals. Assurance of learning also assists the school and faculty members to improve programs and courses. (p. 2)

In AOL processes, each ILO might be aligned to one or more CLOs. In turn, these learning outcomes are shown as being delivered by the assessment processes on one or two modules at any level of study. The AACSB, however, emphasises that accreditation is primarily concerned with broad, *course-level* focused learning outcomes, rather than detailed learning goals by module or topic, 'which must be the responsibility of individual faculty members' (p. 2):

> AACSB accreditation is concerned with broad, (course-level) focused learning goals for each degree program, rather than detailed learning goals by (module) or topic, which must be the responsibility of individual faculty members. (p. 33)

Therefore, course-level faculty (for example, course leaders) have an overarching view of the alignment of learning outcomes through engagement in AOL processes, yet module teaching faculty have primary responsibility for the design of MLOs (and for constructive alignment at the module level). It is these MLOs that are then interpreted by course leaders for alignment to CLOs, and by students for understanding the context of the module within the course as a whole.

Yet there is a lack of clarity in the literature on mapping processes between modules at each level of study for existing curricula. Additionally, in the design of new course curricula, existing modules may be selected to satisfy the course requirements, with little focus on reviewing any content overlap between the selected modules. Further, there is little evidence of processes that examine alignment between modules (within or across levels of study), and vertical mapping between MLOs and CLOs.

## Summary

From the foregoing, we argue that the horizontal and vertical mapping of learning outcomes in curriculum mapping processes is not a straightforward process in higher education institutions (HEIs). One of the primary challenges in constructive alignment, as discussed previously, is this inherent focus on alignment between learning outcomes, the curriculum and methods of assessment at the level of the module. Thus, any *curriculum misalignment* is typically focused on issues within a specific module; however, contributing factors for misalignment may lie beyond the boundaries of any one specific module; for example, where changes in the curriculum content of one module may impact alignment within another module at the same or successive levels of study. Any such misalignment may only be noticeable by the students enrolled on modules within a defined course.

This prompted an examination of the multiple dimensions of alignment that may be required for full constructive alignment to exist. Ultimately, we argue that clarity on the *why* of constructive alignment enhances understanding of, and engagement with, the *what* and the *how*, and to achieve this clarity requires an understanding of constructive alignment processes both at and between the course and module levels – a distinction that is missing in the literature. Our interest in constructive alignment reflects not only the links between syllabus, pedagogy and assessment on a given module, but also how they connect with the syllabus, pedagogy and assessment on other modules, via the multiple potential linkages between CLOs and MLOs.

In the research that follows, we analysed course and module specifications and AOL documents for one course, and we drew on our experience in higher education to understand and isolate these dimensions. The results of this research led to the development of an outcomes-based framework that attempts to capture the multiple facets that may be required for full constructive alignment. This is particularly significant where the learning outcomes relate to the knowledge, skills and attributes that enable students, post-graduation, to continue their personal and professional development, and to be adaptable to changing circumstances throughout their lives.

# Methodology

We used purposive sampling in the selection of one course – BSc Economics – an approach that allows us as researchers to choose one appropriate sample for understanding the linkages that may occur within the framework. BSc Economics was selected for the initial empirical application of the framework as it has a narrow disciplinary focus, where most of the modules are from the same department of the business school, with few optional modules offered from other departments. This is in contrast to multidisciplinary and interdisciplinary courses, where the core and optional modules are selected from across multiple disciplines offered across the business school, such that the modules maintain their own distinct and discrete disciplinary boundaries. According to Chandramohan and Fallows (2009), such multidisciplinary and interdisciplinary courses present greater challenges in the achievement of effective learning and teaching, compared with single-discipline courses.

Data were collected in two stages. First, we analysed information from the following documents:

1. *Course specifications*: these provide the overview and aims of the course, as well as the CLOs. Learning outcomes for each course are described as either knowledge and understanding outcomes, or skills, qualities and attributes. The course specifications also detail the teaching and learning methods for the course, as well as the assessment strategy.

2. *Module specifications*: each module specification document summarises the module content, learning outcomes, teaching and learning methods, and approach to assessment. The document also specifies the courses that contain the module.

3. *AOL documents*: the documents describe the alignment between ILOS, CLOs and MLOs. These documents are constructed as part of external accreditation processes. Each School-level learning goal is aligned to one or more CLOs. In turn, these learning outcomes are shown as being delivered by the assessment processes on, typically, one or two modules at any level of study.

We then recruited a research assistant who was a graduate in BA (Hons) Education from the university's School of Education. The research assistant was provided with matrices to map alignment between learning outcomes. The matrices were created in a Microsoft Word table that included three rows (representing each level of study). For each level of study, the row contained a module for that level; that is, each column of the table contained the module code and the module title. An additional row was created that contained all the CLOs. A separate document contained the MLOs and CLOs; these were derived from the respective module and course specifications. In total, there were 24 (core and optional) modules and 14 CLOs. The research assistant was provided with the matrix templates, plus the MLOs and CLOs, and was asked to complete a mapping exercise.

Specifically, the research assistant mapped horizontal alignment between MLOs at each level of study, and vertical alignment of MLOs to CLOs. In a separate mapping exercise, the research assistant was also provided with the ILOs and tasked with mapping these learning outcomes to the CLOs. The focus of the present article, however, is the mapping between modules, and up to CLOs. Crucially, for this stage of the research, the research assistant was asked not only to undertake a mapping exercise, but also to do so based on their own understanding of the learning outcomes within each course. The choice of background of the research assistant was deliberate, with a detailed knowledge and understanding of processes of higher education, but without the prior knowledge, or perhaps 'baggage', that would come if they had been a student on one of the chosen courses. Indeed, since the purpose of the research is to develop a generalisable constructive alignment framework, it is arguably much more robust to have a research assistant from outside the subject specialisms under investigation, but precisely with expertise in education. The results of this mapping exercise by the research assistant were compared to the results of the mapping from the AOL documents of the respective courses.

We also conducted focus groups with BSc Economics students to get their understanding of the mapping of learning outcomes, thus adopting a phenomenological qualitative approach to understand their personal perception (Creswell and Creswell, 2018; Smith and Osborn, 2003). According to Padilla-Díaz (2015), participants in phenomenological research are generally selected by purposive sampling. Therefore, the focus groups consisted of eight students enrolled on the selected course at different levels of study. Running focus groups with students complemented the perspective of the research assistant and provided an important basis for the subsequent triangulation of data.

As part of the focus group discussion, students were provided with similar matrices for the mapping of MLOs. Students were divided into smaller groups according to the level of study in which they were enrolled (for example, Level 5 students were grouped together). Students were asked to discuss, within their respective groups, how they would map each of the modules to other course modules. The researchers were present, and they observed the students during the mapping exercise. The resultant matrices from the students for the mapping of MLOs were compared to those of the research assistant and to the AOL mappings. Interviews were also conducted with seven module teaching faculty (including the course leader), who represented modules taught at all three undergraduate levels, to understand their perspectives on the alignment between MLOs and up to CLOs, including any perceived challenges to aligning their MLOs to outcomes external to their module. Prior to data collection, ethics approval was obtained from the relevant university Research Ethics Committee, and all participants signed the relevant participant information and consent forms.

The research therefore sought to identify patterns in the data resulting from answers to critical questions such as What do you think this MLO intends to achieve? and What CLO do you think this particular MLO aligns to and why? This sought to bring some understanding of the sense-making by the respective participants, and to gain detailed descriptions of their reasoning when aligning the learning outcomes in order to fully understand the meanings that are derived from the designed learning outcomes.

An inductive approach to data analyses led to the development of the outcomes-based framework that describes the multiple levels of alignment that may exist. Interpretations of the data derived an understanding of the concepts of alignment by setting out the main outline of the phenomenon under investigation, assembling the data, and putting them together to create a coherent whole (Cohen et al., 2018).

## Results and discussion

From our analysis of the documents, and from the results of the mapping matrix completed by the research assistant and students, we identified three distinct dimensions along which constructive alignment can be achieved and maintained to ensure comprehensive constructive alignment of every curricular activity a student undertakes, namely *internal alignment* and *external alignment*, which includes *horizontal alignment* and *vertical alignment*. We explore each of the identified areas for alignment in the sections below, and we also discuss areas where fracture points may occur.

### Internal alignment

The approach to constructive alignment suggested by Biggs and Tang (2011) we refer to as *internal constructive alignment*, that is, the alignment between learning outcomes, content/pedagogy and assessment within each module, consistent with outcomes-based education (see also Daugherty et al., 2008; McCann, 2017). Module teaching faculty are typically given primary responsibility for this *internal alignment* in a module. A curriculum map may be incomplete if there are inconsistencies or misalignments (Bester and Scholtz, 2012), for example, when the MLOs do not accurately reflect the intended content for the module. This may, in part, be attributed to the vague wording used in MLOs. Further, if any of the module content, pedagogy and assessment changes over time, other elements may also require revision to preserve internal alignment. The value to teaching and learning from adoption of the learning outcomes model, however, or its relevance within a constructive alignment paradigm, may not be fully appreciated by teaching faculty (Hadjianastasis, 2017); this was corroborated during our interviews:

> I did not initially [think of curriculum alignment] … when I started, I had inherited the module. I don't think a lot of people may be coming in, are aware that this is something that they need to think about. At least, I wasn't. It was more like you come in and you run, just trying to keep up with everything. (Teaching faculty)

> I remember at the time it [the assessment] was, oh, 40 per cent of the module. The assessment coming from professional practice, that sort of balance struck me as, you know, not being right, you know, it didn't strike me as being appropriate for the nature of the material that we were covering on the module and the sort of skills that we were trying to develop. (Teaching faculty)

Internal review processes can themselves also be a source of fracture: one change to content, pedagogy and assessment may not require formal module-change re-approval, but another might. As one member of the teaching faculty put it:

> [Later] I did a curricular alignment analysis of my module and, after that, actually, I had a little bit of a look of the [specifications]. I find it hard to understand if I can change the [module] objectives or not, so I've kept them. But what I've done is I've changed one of the assessments to much better align with both the activities that we're doing and the outcomes.

Module teaching teams may therefore develop more 'static' learning outcomes, and make changes that do not require formal review, but leave unchanged other aspects that do, to avoid having to navigate potentially lengthy formal review processes for approval of module changes, even if this 'fractures' the previous internal alignment on the module. Thus, misleading information will be provided to relevant stakeholders, as our interviews with teaching faculty demonstrated:

> I remember … from my first couple modules and asking to make changes and [being told] well, you will have to wait until, you know, like SASQ [the School Academic Standards and Quality Committee] next May before you can make these changes. And I was like, God, this is like trying to turn an oil tanker. (Teaching faculty)

> What I quickly found was that the best thing for you as a module leader … you kind of want to change the wording of your module learning outcomes without jeopardising what the outcomes are. OK, you want to change the language so they can be interpreted in as broad a way as possible, so then that allows you, if you do need to make any changes, you're not doing in such a way that you say, oh we're dramatically changing this … if I've worded it as vague as it is here, well then, I can remove this subject if I want, I can add this subject in without saying that [to the committee]. (Teaching faculty)

Teaching faculty also expressed concerns about student perceptions if changes to the module are made that are different to previous years, particularly as this may relate to student feedback submitted at the end of the module:

> A student can never come back to me and say, oh you said this was on the learning outcomes and you haven't covered it … I just have very general broad learning outcomes that allows us to make these changes without kind of, you know, worrying too much about how they're going to be received. (Teaching faculty)

> I mean some of this stuff is very old and no more relevant … [but] it gives students some intuition and why I'm not changing it? I mean if I do that, I know the students will kill me, and I get one on feedback. (Teaching faculty)

In addition to internal constructive alignment, there are multiple dimensions of external constructive alignment, given that most courses taken by students will consist of multiple individual modules, taken both within an academic year and sequentially across the years of study. Different modules will be expected to have different content (although some overlaps in content will reasonably occur) and they may well, therefore, have different approaches to pedagogy, and/or to assessment.

That said, there should be complementarities across modules, as they will be delivered on a specific course that is the focus of the final award. These we refer to as lines of *external constructive alignment*, for which we identify two distinct dimensions that need to be accommodated in MLO and CLO design, specifically, *horizontal alignment* and *vertical alignment.* This feature of the research offers an important contribution to the existing literature, which, as shown above, typically makes no reference to what we argue is a crucial distinction between learning outcomes at the individual module level and the aggregate learning outcomes at the course level. We argue that for comprehensive constructive alignment, the alignment of any given module both with other modules and with the course as a whole is essential for effective learning outcome design, and for a cohesive and coherent experience for students on their chosen course of study.

## Horizontal alignment

The first dimension of external alignment we identify is the relationship between the different MLOs at a given level of study. Alignment across modules ensures that the MLOs at that level make complementary contributions to multiple, but not necessarily all (end-award) CLOs. This we call *horizontal alignment*. With many institutions offering exit awards at the end of levels of study other than the final year, horizontal alignment is also essential for the appropriate constructive alignment of MLOs embedded in those awards. We reflect further on this specific issue below.

The challenge, therefore, comes in trying to ensure a measure of consistency between the content, pedagogy and assessment of the different modules, to ensure limited overlap in content, as deemed necessary for the integrity of individual modules, while also ensuring a range of styles of pedagogy and modes of assessment, as required to deliver a rich learning experience for the students. Fracture points can then occur when such alignment is missing. This might be because MLOs are not explicit on module content or, for example, because of a lack of collaborative reflection on the mix of pedagogies and assessments to provide the richness of student experience which is seen as ideal for the course as a whole. Fracture points thus occur where linkages between the modules are only understood through the learning outcomes, unless module teams work together to be aware of each other's modules, to that level of detail, and can thus view their modules as part of a larger whole, rather than as entirely independent entities:

> In [two modules] there used to be the same module leader for both, so they have quite clear references to each other in the lectures … I think a lot of new people coming on, I don't really know what other modules are doing. I only know that because of conversations with people, often very informal. (Teaching faculty)

These fracture points may in turn be reinforced by the modularised and semesterised structure of the undergraduate course (similar to that of many universities), making the process of recognising the linkages between individual modules, or from the modules to the course as a whole, multiplicatively harder. The following quotations from teaching faculty express frustration with students' inability to recognise connections between modules, but we also wonder what more we can all do to help students in this process by being more transparent about the design issues that we wish students (and other stakeholders) to see – as embedded in the framework presented in this research:

> Oh, continually shocked by is the students' inability or unwillingness to join up the dots. Because I make very, very clear at the beginning of the module that it's an applied module, that we're going to take some of the basic concepts that you came across during your [earlier module] … so we're going to take this theoretical concept and turn it into something practical that economists can use. And every year …  at the beginning of this module, I find myself having to explain some of these basic concepts all over again. (Teaching faculty)

> I can understand how students may struggle a bit when [a concept] is not explicitly stated … but some of the basic diagrams that I bring up in Year 2, even when I am the same lecturer, I have talked to them in Year 1, and I teach them again they are really struggling to make these very direct explicit links. It's a new module, it's a new assessment, so how are they related? (Teaching faculty)

Many HEIs assert that stakeholder involvement in learning outcome design will, of itself, enable greater understanding of the meaning and value of learning outcomes, and therefore will help to eliminate fractures in constructive alignment processes. New university courses therefore may engage in 'curriculum design sprint' processes, where, over a period of two or three days, a range of stakeholders (including students, teaching faculty and other stakeholders, for example, the external business community as major employers of graduates) provide their expertise and feedback on the proposed course. During the design sprint, alignment of module and CLOs are completed, and there is discussion on the module content. Where existing modules are added based on the requirements of the course, any overlap of module content is not specifically discussed, and there are no requirements for ensuring alignment after the course is approved. The fracture point here may therefore be in establishing a process that results in imbalances between individual agency and collective action in the pursuit of common goals:

> … each of the individual lecturers were, like, oh well – I just want to teach my principles of macro course. I want to teach my intermediate macro course, etcetera. No one was talking to anyone. Everyone just wanted to do their own thing, and then you end up with these Grand Canyon-sized gaps in the material that's supposed to be taught to the students … I don't think it's the case that we should be 100 per cent consistent, and I don't think it's the case that the degree should be the Wild West. It's like there are certain subjects where there are massive payoffs to having a consistent approach, and then there are other subjects where consistency is less required. (Teaching faculty)

Most notably, the foregoing demonstrates how horizontal alignment requires cooperation between academics over how 'their' module links to other modules (and to CLOs), especially if adaptation to various aspects of their module is required in order to ensure an appropriate level of coordination in support of the student experience. However, students' understanding of these linkages may be influenced by their experiences at the secondary level of education:

> Occasionally, I have merged my seminar group with another [tutor on a related module]. I think we genuinely have a real problem [in horizontal alignment] and I think some of these behaviours are, you know, essentially baked into our students before they get to us … they just think very narrowly and instrumentally in terms of, 'right, I have to pass this assessment, I have to pass this assessment.' They don't think in terms of, I am receiving this broad education in this disciplinary area. (Teaching faculty)

In addition to the horizontal linkages between modules at a given level of study as part of a completed degree course, and as noted above, many HEIs offer 'exit awards' for students who do not complete the full course of study (typically of three or four years, depending on the country). In England, these awards are known as the Certificate of Higher Education for successful completion of Level 4; and the Diploma in Higher Education, for successful completion of Levels 4 and 5. Level 4 corresponds to the first year of studies for a three-year undergraduate degree programme or course; some students may enrol on a four-year degree, which comprises, first, two years of full-time studies (Level 4 and Level 5), then a 'sandwich' or placement year, followed by the final year of studies (Level 6). In each case, level-specific CLOs (should) also apply, to which the MLOs should align. Horizontal alignment therefore extends to that of comprehensive alignment between MLOs and the full set of exit-award CLOs, not just the final degree award. Benchmark exit award statements by the Quality Assurance Agency for UK higher education, and complementary Credit Level descriptors suggested by the independent SEEC agency (formerly, the South East England Consortium for Credit Accumulation and Transfer, now just SEEC) broadly describe outcomes at each level to which these exit awards should also align.

One potential fracture point in this context occurs when students in possession of a lower-level exit award seek to re-enrol at another HEI to complete their course of studies, *absent* a formal process of mapping that level of detail in the earlier award to the award for which they are being signed-up. Some assumptions may be made with respect to the naming of modules (such as 'Principles of Microeconomics'), with the expectation that the student has satisfied certain learning outcomes; however, the information provided is not always precise. For example, while the content of a Level 4 'Principles of Microeconomics' can plausibly be assumed to be consistent across HEIs, by Level 6, the names of advanced microeconomics modules might vary much more.

## Vertical alignment

Within a higher education course, CLOs are typically described only in relation to exit after the final year of study (excluding extracurricular activities, such as year-long work placements on 'sandwich' degrees). These are attained via the successful completion of individual modules across all years of study, even though the final degree classification might exclude Level 4 grades (occasionally also Level 5). AOL processes therefore (typically) map each CLO to final year MLOs. Ideally, however, for the purpose of curriculum mapping, two types of vertical alignment are distinguished.

First, one type of vertical alignment occurs where a subject is taught progressively at different levels of study, such as microeconomics at all levels of an Economics degree. As a narrow disciplinary course, the nomenclature or naming convention of many of the modules for BSc Economics may suggest alignment between modules at different levels of the course – for example, 'Principles of

Macroeconomics' at Level 4 can be assumed to align to 'Intermediate Macroeconomics' at Level 5, and thence to 'Advanced Macroeconomics' at Level 6.  Thus, the lower level MLOs are seen to contribute *cumulatively* to MLOs at higher levels of study (the earlier caveat around naming conventions notwithstanding), and thence through to the realisation of relevant CLOs:

> There are so many things in the first year that we can't really change because they are the building blocks for the second year and third year.  So the agility with these modules is so much smaller … that even if we did a, you know, curricular analysis on the whole module, it's very hard to change things ... we tried for a while to have short essay-style questions mid-term [instead of a multiple choice question examination] to get them to do a different type, but that meant they got really in-depth knowledge on one topic, and we didn't get an understanding of how they did in any of the other ones … balancing all of those things at the same time makes it hard to be as agile. (Teaching faculty)

Yet not all subjects are taught in this progressive manner.  Second, therefore, in terms of curriculum content, some modules may be 'stand-alone'; in other words, they do not feed directly and explicitly into modules at subsequent levels, but they need their learning outcomes to align directly with one or more CLOs.  A Level 4 module may therefore align directly with a CLO, without vertical alignment to modules at Levels 5 and 6.  Additionally, should each module not specify relevant pre- or co-requisites, the connection between modules at the same or different levels of study is not immediately clear.  Further, a fracture point may be seen to occur in the selection of optional modules by students where the optional module has not been designed to contribute towards any of the CLOs on any of the courses on which students are enrolled.  Equally, a CLO may not be met by any of the core module outcomes, but it is nevertheless being satisfied by that optional module:

> For Level 4, principles of micro, principles of macro, and then quantitative methods ... [they are] fitting in.  But then you bring in the personalisation modules … I think, OK, where do we fit those in? ... there is always the tricky bit with those modules that are designed at the school level instead of the department level. (Teaching faculty)

> Yeah, it blows my mind, the fact that I have to be in meetings where we're, like, trying to figure out, you know, is DPI [Developing Professional Impact] Economics students doing similar stuff to like DPI Marketing module, yeah, and yet we have all these Econ modules that are related to one another, and we don't have any meetings to focus on that. (Teaching faculty)

At the very least, therefore, there should be at least two modules contributing to each CLO, with at least one of these being a core/compulsory module.

## An outcomes-based framework

The result of this analysis is a conceptual constructive alignment course-level framework (Figure 1) that attempts to unpack the *black box* (Barnett, 1988) of possible constructive alignment processes that occur between students' entry and exit points.

This allows us to isolate the multiple dimensions of alignment that may exist for analytical purposes, before packaging them into a coherent whole that captures the connections that may be required for full constructive alignment at the course level, as required in curriculum mapping processes. The framework (Figure 1) illustrates the multiple layers at which constructive alignment should contribute to a consistent narrative around MLOs and CLOs. This narrative should therefore underpin the logic behind the design of learning outcomes, at both module and course levels, ensuring that both their internal and external syllabus, pedagogy and assessment align, something that remains absent from most considerations of learning outcomes and constructive alignment.

**Figure 1. Outcomes-based framework: alignment between MLOs and CLOs**
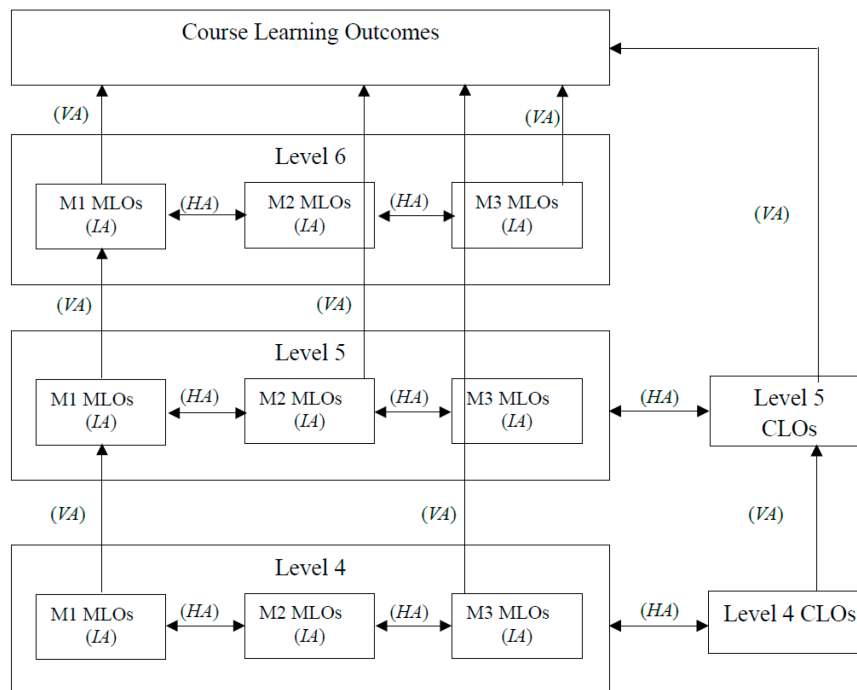


Notes: IA – internal alignment of module content, pedagogy and assessment; HA – horizontal alignment of MLOs at a given level of study; also alignment between MLOs and exit-award CLOs at Levels 4 and 5; VA – vertical alignment between MLOs of modules taught at different levels – but representing cumulative/progressive syllabuses (for example, Microeconomics taught at Levels 4, 5 and 6) – and CLOs; vertical alignment between the MLOs of standalone modules and CLOs; and also vertical alignment between exit-award CLOs at different levels.

The outcomes-driven framework therefore seeks to address the *why* in curriculum design processes, and it can therefore be 'simultaneously useful to regulatory bodies, curriculum designers, teachers and students' (Hadjianastasis, 2017, p. 15). This framework points to a need to examine alignment not only top-down (from course level outcomes down to the module level) but also upwards from the module level to CLOs. The former approach is influenced primarily by external accreditation agencies and course-level faculty, whereas the latter perspective is influenced primarily by students and module teaching faculty:

> Over time … as we've adapted our modules, we have thought more of our course learning outcomes and how they map … we [as teaching faculty] tend to start with our course learning outcomes, and we then map downwards to module learning outcomes. So, whereas students are looking from the ground up, we are always starting from the top and working down … but, of course, a lot of it is how you interpret these course learning outcomes and what do they mean to you as an individual. (Teaching faculty)

> I think there is a lot that [the outcomes-based framework] really helps with when you look at it. So, when you look at it, you go, well actually, maybe when I'm designing my module, I should actually start at the ground level and work upwards. But then, I should also work back down again to make sure that I actually have outlined everything, and I don't think that process always happens. (Teaching faculty)

The outcomes-based framework illustrates the multiple dimensions of alignment to be considered during curriculum mapping processes. Based on our results, in attempting to achieve constructive alignment in business education, we saw that tensions may occur between a modular undergraduate curriculum that preserves artificial disciplinary and topic boundaries, a higher education narrative that espouses disciplinary fluidity, and a world view that recognises the increasingly interconnected nature

of different disciplines. It is not the purpose of this research to revisit or revise the first principles of wording learning outcomes (Bloom et al., 1956; Herbert et al., 2009; Hussey and Smith, 2002; Murtonen et al., 2017). Learning outcomes are valuable in generally describing what and how students learn; however, in curriculum mapping and AOL processes, learning outcomes may be used merely as an auditing exercise primarily to ensure alignment with course- and institutional-level outcomes, and to meet the requirements of external accreditation agencies, without reflecting on the pedagogic benefits of accurate constructive alignment, as well as ensuring a clear and coherent syllabus and, ultimately, a clear and enriching learning experience for students.

## Curriculum misalignment and the outcomes-based framework

We have identified multiple fracture points that may occur during curriculum mapping processes, which lead to misalignment in the curricula, if not adequately addressed. From our perspective, the multiple dimensions of constructive alignment identified in the outcomes-based framework, connecting MLOs and CLOs into a single coherent whole, are not systematically and routinely made explicit. Indeed, this might result from external processes that seek to monitor course quality, but which might also inhibit innovation:

> The course learning outcomes in the format that you currently see them and view them in the documentation that we have available came about as part of EQUIS [EFMD Quality Improvement System] accreditation or AACSB … The course learning outcomes are kind of standardised, so they are very similar across many courses, and there are few outcomes that are course specific. (Teaching faculty)

> So when you talk about misalignment, I think a lot of the misalignments come about because we had course learning outcomes, and then we sort of forced the modules into those course learning outcomes originally. So, we picked modules that we thought matched those course learning outcomes. (Teaching faculty)

Therefore, a fracture point occurs where no single group of stakeholders has an overarching and complete understanding of the matrix of alignments, but instead alignment is attempted in a piecemeal fashion without recognition of the interdependencies that should be present in a robust curriculum map. For example, in the design of learning outcomes, external accreditation agencies suggest that:

> Learning goals and curricula reflect expectations of stakeholders. Schools incorporate perspectives from stakeholders, including organizations employing graduates, alumni, students, the university community, policy makers, etc., into curricula management processes. (AACSB, 2019, p. 33)

And that:

> Each programme must have clearly stated aims, objectives and learning outcomes and potential indicators of impact … The design and content of programmes should embrace a comprehensive range of theory and research, firmly connected to the practical world of business and management in both local and international contexts. (EQUIS, 2025, pp. 25–6)

While accreditation agencies and professional bodies have an overarching understanding of the *why* of CLOs, as they connect graduates with their post-university journeys, the attention of other stakeholders may primarily be on the *how* and *what* of MLOs. Teaching faculty, for example, are primarily responsible for the design of MLOs, which are interpreted by course leaders for alignment to CLOs and by students for understanding the context of the module within the course as a whole. However, the possibility of misinterpretations of these designed learning outcomes leads to a widening of the gap between the 'author' (teaching faculty) and the 'reader' (students) (Hodder, 2000), further contributing significantly to the emergence of fracture points in mapping processes. This is illustrated in a comparison of the mapping exercises completed as part of our research on the BSc Economics degree course documentation (Figure 2). In the interest of space, the mapping focuses on four core modules at each level of study.

**Figure 2. Perceptions on horizontal and vertical alignment of learning outcomes**
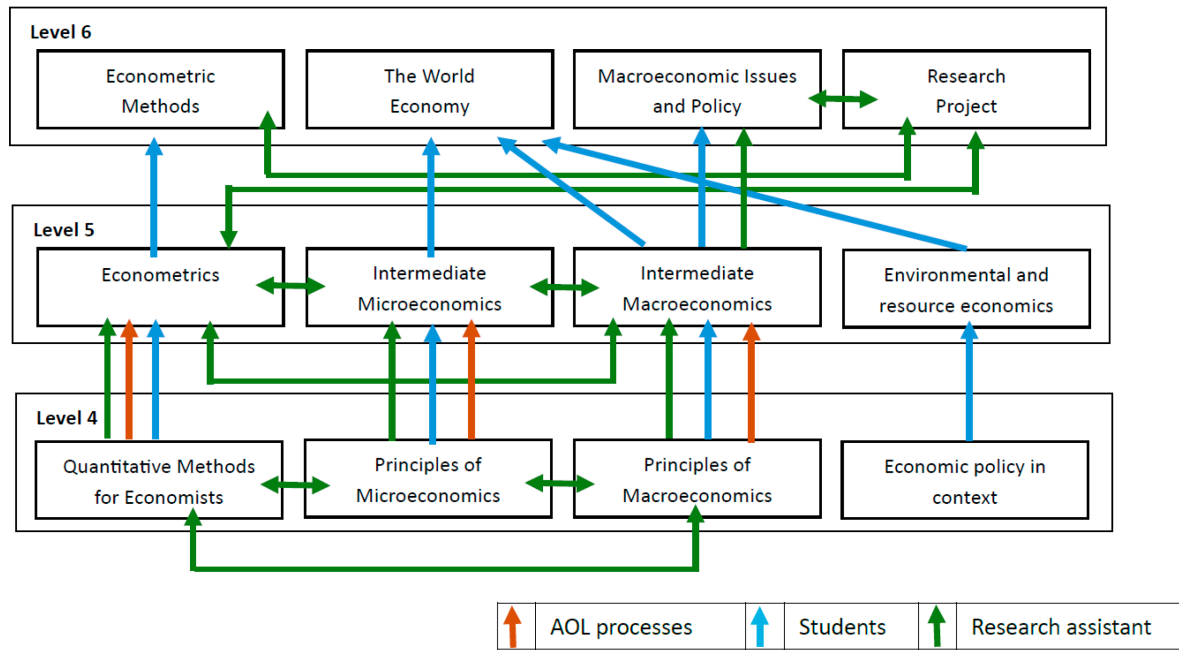


From a student perspective, horizontal and vertical alignment between modules within and across different levels of study may be particularly important. Although students were provided with the MLOs as part of the mapping exercise, discussions within their respective focus groups centred on the mapping of learning outcomes by thinking about the module content; typically, students made the connection between modules based on what they (or their peers) remembered of the content in the respective modules.

The research assistant completed the mapping exercise by highlighting the key words in the *learning outcomes* that led to mapping between modules; thus, the research assistant perceived module linkages based on the terminology used in the MLOs without having access to the module content. Students however formed linkages from Level 4 to Level 5 modules based on the perceived overlap in module content, rather than on the wording of the MLOs. Although there are few student-focused evaluations of learning outcomes and constructive alignment (Bone and Ross, 2021), evidence suggests that students tend to compartmentalise domains of knowledge and find it difficult to establish content links, both within and between subject areas at different levels of study.

From the results, however, students made sense of the links between modules based on what they remember of the content of the module (when prompted by other students in the group), but they failed to make connections by only reviewing the learning outcomes. Further, AOL processes present only a partial picture of the links between modules, as these processes are primarily focused on alignment between MLOs and CLOs. Specifically, AOL processes focus on the CLOs, and the modules that can directly measure (or assess) achievement of these CLOs. The research assistant was asked to complete mapping between CLOs and MLOs based on the wording of the outcomes provided. The results (together with the mapping from AOL documents) are presented in Table 1, which illustrates minimal overlap between the research assistant's interpretation of the learning outcomes and the mapping defined by AOL processes. Understandably, the AOL process requires enough information to confirm connectivity within the framework, although the framework points to several areas of potential misalignment.

For example, against CLO7 (Critically evaluate arguments, assumptions, concepts and data [that may be incomplete] to make judgements and decisions and frame appropriate questions to achieve solutions to business problems), AOL documents point to the Level 5 module (Econometrics) and the Level 6 module (Research Project). However, the Level 5 module may not be available to those students who undertake the optional semester-long in-company project in Semester 2. There may also be

modules, such as the final year Research Project, that align to several CLOs (based on the AOL processes of using the assessment criteria); however, several key elements in the assessment matrix may be omitted. For example, one question emerges about how it would be possible to compare a student who engages very little with the research supervisory process, but who delivers an excellent research project, against another student who uses all the available supervisory time allotted but then may not necessarily be delivering a project that reflects independence in their work. One critical fracture point therefore also occurs in the use of constructive alignment at the course level. As discussed earlier, there is a clearer understanding of constructive alignment at the module level; however, the literature notably does not explicitly differentiate between MLOs and CLOs in the description of constructive alignment.

**Table 1. Perspectives on alignment between CLOs and MLOs**

| | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 | CLO7 | CLO8 | CLO9 | CLO10 | CLO11 | CLO12 | CLO13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quantitative Methods for Economists (L4) | | | | | | | | | | | | | |
| Principles of Microeconomics (L4) | RA | | | | | | | | | | | | RA |
| Principles of Macroeconomics (L4) | | | | | | | | | | | | | |
| Economic Policy in Context (L4) | | AOL | | | | | | | | | | | |
| Econometrics (L5) | | | | | | | AOL | | | | | | RA |
| Intermediate Microeconomics (L5) | | | | | | | | | | | | | |
| Intermediate Macroeconomics (L5) | | | | | | | | | | | | | |
| Environmental and Resource Economics (L5) | | | | | | | | | AOL | | | | |
| Econometric Methods (L6) | | | | | | | | | | | | | RA |
| The World Economy (L6) | | AOL | | AOL | | | AOL | | | | | | |
| Macroeconomic Issues and Policy (L6) | AOL | RA AOL | | RA | AOL | AOL | | | | | AOL | AOL | RA |
| Research Project (L6) | | | | | AOL | AOL | AOL | AOL | | | | | |

The utility of the framework is therefore crucial in highlighting areas where fracture points may occur and lead to possible curricular misalignment. Further, from a constructivist perspective, knowledge is constructed cumulatively by the learner through both individual and social discourse, where this process is shaped by the learner's own previous knowledge and assumptions (Biggs, 1996). Yet, as discussed in this article, incorrect assumptions and interpretations around CLOs and MLOs may be reinforced by rigid higher education structures and inflexible processes for learning outcomes design and constructive alignment. The conceptual outcomes-based framework will therefore ultimately provide transparency to all stakeholders, bringing clarity of understanding not only for *what* and *how* in teaching and learning, but also – and crucially – the *why* in learning outcomes design.

## Recommendations and future research

The complex interrelationships identified in the outcomes-based framework, and visualised through curriculum mapping processes – connecting MLOs and CLOs into a single coherent whole – are not systematically and routinely made explicit. The outcomes-driven framework therefore addresses the holistic *why* in curriculum design processes. The term 'fracture points', defined earlier, more accurately describes the issues that may lead to actual misalignment between learning outcomes, along any of the dimensions identified in the framework. This term therefore reflects the need to 'repair' fractures where they have occurred.

As a practical implementation of this framework, manual processes can be undertaken to develop databases that include the topics and content taught on each module. With current advances in technologies, including artificial intelligence, we suggest the creation of automated processes for 'scraping' and analysing information such as module topics, assessment types, pedagogical approaches and content from the learning rooms or respective module documents, such as teaching materials and module timetables. Post-pandemic, many UK-based HEIs have facilitated the creation of online learning rooms for students, such that content for respective modules is (and is likely to continue to be) digitally available. In recent research, artificial intelligence tools such as ChatGPT have been suggested for use in module and course design, and they can support constructive alignment processes (Houssaini et al., 2024; Pereira et al., 2024; Stretton et al., 2024). Therefore, it is not unreasonable to suggest that digital

technologies, where available within HEIs, can facilitate design-automated processes for populating databases with module content.

We go a step further to suggest that any overlap in content or topics can be highlighted within the results using automated processes. These databases, accessible by module teaching faculty and course administrators, can support horizontal and vertical alignment processes, by describing (and linking) information that learning outcomes do not make explicit. This would provide in-depth understanding of teaching and learning activities on other modules to help support module internal (and external) alignment processes. Successful implementation would also be predicated on consistent language being used, which itself will enhance clarity of messaging to all stakeholders around learning outcomes and constructive alignment.

In this article, we have focused on one management education undergraduate module, BSc Economics, to explore and illustrate the facets of alignment highlighted by our framework (Figure 1). Further research can focus on comparative analyses of other courses, particularly multidisciplinary and interdisciplinary courses, such as BA Business in a business school context, to understand how fracture points (and the contributing factors) may differ across multidisciplinary and interdisciplinary courses. However, this perspective, and the proposed use of advanced technologies, needs to be balanced with the context in which they are proposed. According to Sin (2014, p. 1835), there is a general assumption that the use of learning outcomes will automatically result in a shift to student-focused learning, such that these 'formal procedures and tools precede and bring about cultural change, rather than the other way around'. Further research will examine the framework, not only using an interdisciplinary lens, but also to further understand its application for supporting improved equities in education.

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### Research ethics statement

The authors declare that research ethics approval for this article was provided by the Research Ethics Committee at Nottingham Trent University for the interviews and focus groups conducted as part of the data collection.

### Consent for publication statement

The authors declare that research participants' informed consent to publication of findings – including photos, videos and any personal or identifiable information – was secured prior to publication.

### Conflicts of interest statement

The authors declare no conflicts of interest with this work. All efforts to sufficiently anonymise the authors during peer review of this article have been made. The authors declare no further conflicts with this article.

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