

Opportunities and Challenges for Flexible Learning in STEM Higher Education

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Research Domains

Higher Education policy (HEP)

Abstract

It is the intention within the ongoing Bologna process to experiment with flexible learning across the European Higher Education Area (EHEA). Through the operation of a pan-European pilot project, the QTedu Open Master (QTOM), we examine the opportunities and challenges faced by universities when sharing courses and projects online. This initiative is intended to widen access to specialist STEM fields, enhancing flexibility for participating Master's students. Nineteen interviews with pilot partners have been conducted, demonstrating numerous differences in the local accreditation mechanisms available for outside courses. These are a crucial lynchpin required for students to benefit from online course exchange. It appears that a lack of standardised mechanisms is a significant obstacle in realising the vision of the EHEA. To empower students to plan their own learning paths, and thus their route to a specialist career, may require systemic reforms of which this project represents a first step.

Full paper

Introduction

The ongoing Bologna process reforms include, at present, a focus on incorporating flexibility into degree programs [1,2]. In doing so, universities have been encouraged to experiment in areas such as

transnational education, virtual and physical mobility, and provision of small, flexible course units [2]. The systems underpinning the European Higher Education Area (EHEA), such as ECTS transferrable credits, are intended to be “translated into concrete actions” with “measurable qualitative indicators” [3].

The actions described in this study lie within the rapidly developing and highly impactful STEM field of Quantum Technologies (QT) [4,5]. It is now crucial to develop the workforce of the Quantum industry by widening access to high-quality, specialist education [6]. The *QTEdu Open Master* pilot project (QTOM) [7] is a first step in this direction. Over the academic year 2021-2022, 26 universities have shared specialist courses and projects online, generating opportunities for students across Europe to incorporate flexibly into their degree programs. This research evaluates the viability of scaling up the approach in line with the goals of the EHEA, through the following research question:

What are the benefits, opportunities, and challenges for exchanging online QT courses among European STEM Master’s programs?

Methodology

An interpretive research paradigm [8] is adopted, reflective of the researcher's positionality as both an insider (coordinator of QTOM), and an outsider to each participating institution [9]. Following ethical approval, 19 members of staff responsible for institutional participation in QTOM were interviewed, following a semi-structured rubric adjusted to the individual context of each university’s participation. Interviews were recorded, transcribed, and accompanied with research notes made during the pilot’s operation, describing the wider context of each institution. Coding of interviews and contextual notes is currently underway.

Here we focus on one particular *sensitising concept* [10] encountered early in the data collection: the significant differences among partners in their accreditation mechanisms for outside courses. Such systems are a crucial lynchpin required for students to take advantage of online course exchange. The emergence of this concept led to a graphical representation of these mechanisms, indicating their “degree of formality” (Fig 1). From the third interview

this was included in the rubric as a discussion artefact.

Preliminary Findings

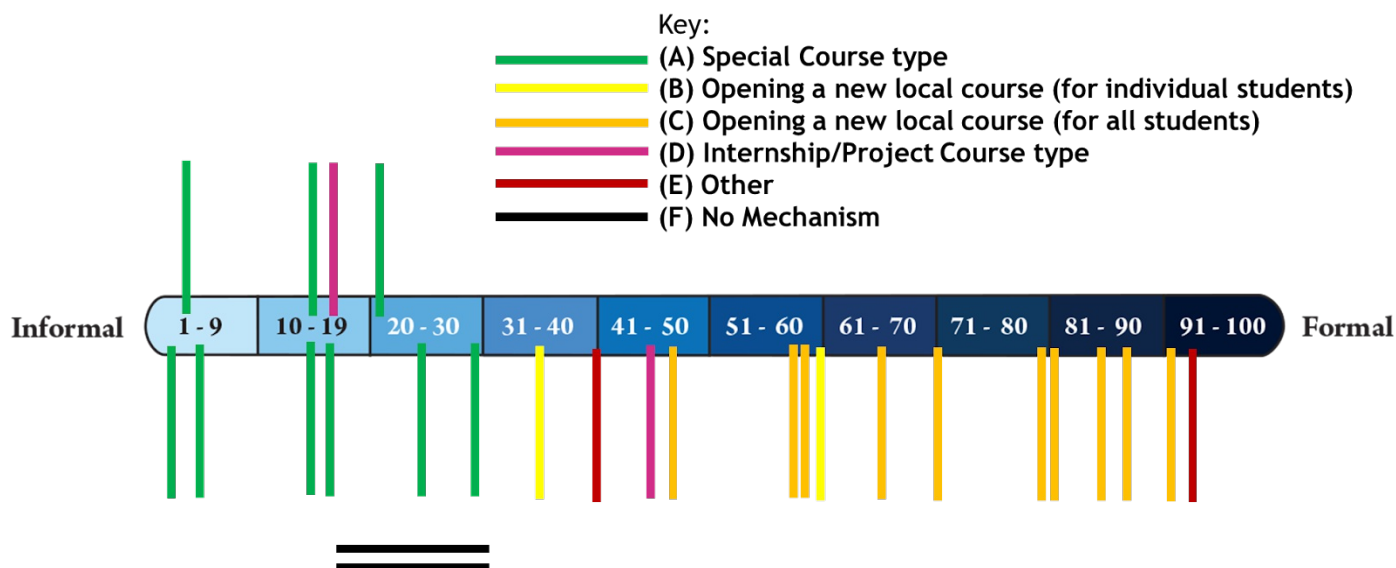


Fig 1: Preliminary classification of accreditation mechanisms. All but two of the participating institutions found systems enabling their students to participate. Whilst they each have different practicalities, they broadly fall into the categories **(A)**-(**E**) shown above.

Most descriptions of relatively informal systems are best described as special courses **(A)**. These features of study programs are designed to be mapped to one-off opportunities, and offer some flexibility for students within their overall degree. Interviewees described them using terms such as “joker card” or “free course”, reflective of their breadth of application.

They generally require bringing course information before individuals or committees in leadership positions for approval, or assigning a member of staff to act as a “guarantor”. Whilst often straightforward to set up, many participants noted significant disadvantages. Courses followed online may not appear by name on the diploma supplement, instead showing a code or generic title such as “traineeship”. They may be limited to low or specific number of ECTS, and involve additional local examination requirements. Furthermore, many participants described how repeated use of their “jokers” may generate scrutiny from the department, as in many cases they faced reluctance to introduce changes into the study

program.

More formal systems usually involved opening new local courses (**B** and **C**). Participants described numerous barriers to this process, such as the time-consuming nature of the setup, inflexible attitudes of management, and restrictions on changing the program structure due to local government accreditation. However, these courses may offer some advantages such as unlimited student participation, no restrictions on ECTS, and permanent elective status in the curriculum.

Conclusion

While it would seem beneficial for universities to utilise more formal mechanisms in order to scale up course exchange, many participants described a barrier in the form of burdensome administration requirements and institutional inflexibility. It is clear that all the benefits associated with formality disappear when the system is beyond the capacity of the individuals involved to deal with. Mechanisms lying relatively centrally in formality, decoupled from bureaucracy, may offer the best balance to enable students and departments to benefit from online course exchange. For the EHEA, it seems likely that the vision of “flexible learning paths” [2] is going to require greater standardisation of systems such as course accreditation. Projects such as QTOM may slowly set this reform in motion.

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