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Beyond Boundaries: The Role of Learning Types in Shaping MOOC Learner Engagement and Progression

COLLECTION:
OPEN LEARNING AND LEARNING AT SCALE: LEGACY OF THE MOOCS

ARTICLE

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ABSTRACT

Utilising the ABC Learning Design based on the ABC curriculum design method (Young & Perović 2016) and the Conversational Framework (Laurillard 2012), specifically the six learning types that underpin that model, eight Massive Open Online Courses (MOOCs) from Coursera or FutureLearn were examined. These MOOCs were selected because they represent a wide range of disciplines, assessment options, and course structures. This paper will demonstrate how the application of various learning types impacts how learners engage with the material, progress through the course, and how it influences their commitment to continue learning (Martin & Bolliger 2018). Additionally, results from this research provide evidence of how the frequency and sequencing of learning types create opportunities for learners to engage with content in a meaningful way.

By synthesising the secondary data from pre-course surveys, exit surveys, end-of-course surveys, comment sections, and several other course metrics, including but not limited to the watch-through rates and technical feedback of over 400 videos, course completion, assessment completion, and learner satisfaction, seven key areas of impactful course design were identified and will be explored throughout this paper. These key areas will focus on the following elements of course design (1) quality and duration of videos, (2) balance and distribution of acquisition learning types (3) structure of discussions, (4) effective guidance for exploration activities, (5) balance of assessment and feedback opportunities, (6) utilisation of e-learning tools and plug-ins, and (7) successfully leveraging the synergies between the learning types in online course design. This empirical research will present evidence on how learning types can be successfully deployed in course design and course design sequencing.

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1. INTRODUCTION

Appropriately deployed course design methodologies play a critical role in the eco-system of designing Massive Online Open Courses (MOOCs) and online courses. Learning designers and course staff require common ground in which to plan, debate, test and rework course design plans, using key course attributes such as, Intended Learning Outcomes (ILOs), assessment methods and course aims to achieve this (Kerr, Dale & Gyurko 2019). There is a plethora of course design approaches available for staff to deploy when developing MOOCs. These include, but are not limited to, assessment mapping, visual storyboarding or utilising a backward design approach (Kerr et al. 2021; Conole 2014). There is also a large body of evidence developed over the last decade that focuses directly on MOOC retention rates and learner motivations for undertaking MOOCs (Badali et al., 2022; Liyanagunawardena, Williams & Adams 2013; Khalil & Ebner 2014; Ho et al. 2015). Therefore, this research draws inspiration from this but does not focus on traditional motivational enrolment points.

This empirical research focuses on the University of Glasgow MOOCs that were developed using the ABC learning design process of Young & Perović, which in turn were underpinned by Laurillard's (2012) theoretical model Arena, Blended, Connected (ABC) Learning Design for online and blended courses. The ABC learning design is comprised of six 'learning types', which are: Acquisition, Investigation, Practice, Discussion, Collaboration and Production. These learning types, derived from Laurillard's (2012) theory-based Conversational Framework, provide a pedagogically informed design method that caters to the rapid development of online courses, such as MOOCs (Young & Perović 2016). By gathering and analysing data from eight MOOCs, this research seeks to draw parallels from the design sequencing arena and connect this to the direct impact this has on learners. In doing so, the authors seek to address two fundamental questions:

RQ 1. How does learning design influence learner experience and skills development?

RQ 2. What motivates learners to engage and complete MOOCs?

The research questions were formulated from the two research themes put forward by the University of Glasgow's Learning & Teaching Development Fund (LTDF), which funded this research and aims to support the 'developments in the practice of learning and teaching that will make significant contributions to the enhancement of learning and teaching across the University' (University of Glasgow 2022). The themes are, (1) Evidencing how learning design influences learner experiences and skills development, and (2) Producing institutional guidance around what motivates learners to engage and stay the course with MOOCs, which align with RQ1 and RQ2, respectively.

1.1 STRUCTURE OF PAPER

The main body of this paper contains 6 sections. Along with an introduction, this first section contains the conceptual framework that outlines the research process and background on the six learning types of the ABC learning design. The next section is the methodologies and methods, followed by results, discussion, limitations, and conclusion.

1.2 CONCEPTUAL FRAMEWORK

To address these themes and answer the relevant research questions, a conceptual framework was developed, utilising the existing models of the explanatory sequential design used by researchers (Creswell 2015; Toyon 2021) in mixed-methods research, displayed in Figure 1. This framework outlines the theoretical paradigms, considerations, and approach of inquiry that aligns with the research questions and predicate the methodology of this research (Saunders, Lewis & Thornhill 2019: 130).

The ontological position of critical realism was selected because it provides practical guidance for a mixed-methods approach (Mingers 2004; Venkatesh, Brown & Bala 2013) by offering internal and external validity between variables in the quantitative data and extending descriptive validity to the behaviour observed in the qualitative data (Zachariadis, Scott & Barrett 2013). Paired with the epistemological positions of pragmatism and post-positivism, both of which advocate the use of multiple methods to identify and interpret research results

(Moon & Blackman 2014), the abductive approach to inquiry provides a conduit between the theoretical perspectives and the data (Morgan 2007). Including the theoretical and conceptual background in the depiction of the conceptual framework creates awareness of the philosophical orientation of the researchers that guide the research process.

Throughout the explanatory sequential design, depicted in Figure 1, the influence of the ontological and epistemological positions can be observed in all three phases, including the connective areas within the research process that link the phases together.

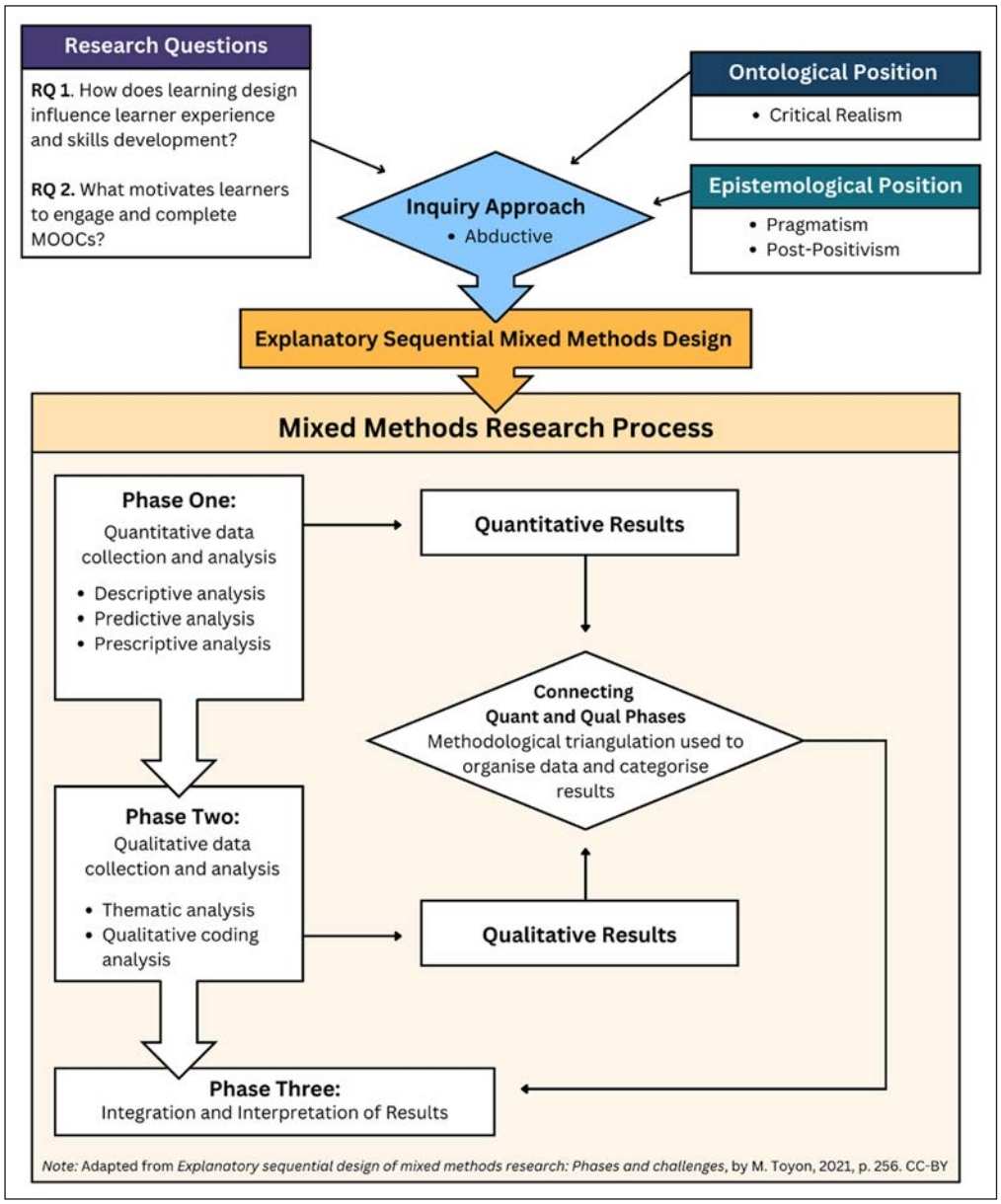

Figure 1 Conceptual Framework for the Explanatory Sequential Mixed Methods Design.

1.3 ABC LEARNING DESIGN: LEARNING TYPES

Developed as a workshop to help educators create visual storyboards of learning activities that meet the ILOs of a course, the ABC learning design process provides a pedagogically sound approach to designing blended and online courses. The six learning types represent a cycle that exists between learner and teacher, or learner and peers, at the concept or practice level (Young & Perović 2020) so educators can reframe a course through a series of activities that focus on the delivery mode. Below, the six learning types are defined with examples.

1. **Acquisition:** Activities where learners gain knowledge through reading an article or book, watching a video or pre-recorded lecture, or listening to an audio clip or podcast.
2. **Discussion:** Activities where learners exchange ideas, ask questions or answer questions posed by the instructor or peers.

3. **Investigation:** Activities where learners source information through inquiry, exploring resources and evaluating what they find.
4. **Collaboration:** Activities where learners work with their peers to produce a shared output through teamwork, negotiation, and group feedback.
5. **Practice:** Activities where learners can apply the knowledge gained from their course to respond to a task and they are given feedback on their output so they may attempt the task again.
6. **Production:** Activities where learners produce something to be evaluated by the teacher allowing them to display their learning.

(Young & Perović 2020)

By focusing this research on MOOCs that were developed using these learning types as pedagogical building blocks, this research can examine how this particular learning design influences learner experience and skills development while uncovering what impact course design has on learner engagement and course completion.

2. METHODOLOGY AND METHODS

This research applied a mixed methods approach, using an explanatory sequential design as a continuum roadmap to guide the process and provide a relevant but flexible structure to identify, evaluate, and incorporate secondary quantitative and qualitative data (Creswell 2015; Watkins 2022). The purpose of this method is to prioritise the collection of qualitative data to 'explore a phenomenon' and then gather the qualitative data to 'explain relationships' or patterns found in the qualitative data (Subedi 2016). This methodology was ultimately selected because it aligns with the objectives set by the guiding research questions and the data types available through the partnership platforms. Using secondary data, this research aims to understand how learning design influences learner experience and skills development and to identify what motivates learners to engage with and complete online courses.

It was determined that solely relying on either qualitative or quantitative data alone would be insufficient in capturing the necessary granular details, overarching patterns, and defining characteristics of the data types that, when examined collectively, offer the insights and contextualisation required for a robust analysis (Ivankova, Creswell & Stick 2006).

2.1 DATA SAMPLE

The first phase of this research involved reviewing the quantitative data, which helped set reliable and meaningful thresholds for course identification and selection. Of more than 60 courses available to research, less than half qualified due to inadequate secondary quantitative data. The list of qualifying courses was narrowed down to eight MOOCs by prioritising courses that were completely available to all learners with free accounts, represented a variety of disciplines, and exemplified prominent differences between both platforms (Table 1). It is essential to note that much of the data assessed in the first phase also represented the quantification of available qualitative data for each course, which would be necessary for later data analysis and interpretation (Subedi 2016).

Table 1 Description of MOOCs selected for research.

SELECTED COURSES	PLATFORM	DISCIPLINE	COURSE DURATION	COURSE LEVEL
Course A	Coursera	Medicine and Data Visualisation	4 Weeks	Intermediate
Course B	Coursera	Diversity and Inclusion	4 Weeks	Intermediate
Course C	FutureLearn	Creative Arts and History	5 Weeks	Beginner
Course D	FutureLearn	Education	3 Weeks	Beginner
Course E	FutureLearn	Culture and History	4 Weeks	Beginner
Course F	FutureLearn	Computer Science	6 Weeks	Intermediate
Course G	FutureLearn	Health and Medicine	2 Weeks	Beginner
Course H	FutureLearn	Teaching and Data Science	3 Weeks	Beginner

2.2 CATEGORIES AND DATA ANALYSIS

The second phase of the explanatory sequential design consisted of collecting and analysing the qualitative data to 'contextualise and enrich' the quantitative data (Bowen, Rose & Pilkington 2017). During this phase, relevant and harmonious categories were created so the quantitative and qualitative data collected from both platforms could be organised effectively for later interpretation. Setting up these data categories and integrating the results relied on intentional triangulation as a mechanism to 'produce convergent findings' (Erzberger & Prein 1997) between the LTDF research themes that guided this research, the ABC learning design theoretical framework (Laurillard 2012) for online courses, and the available secondary data, shown in Figure 2. By deploying this method of triangulation, the quantitative and qualitative results can be effectively integrated (seen in Figure 2), while the theoretical perspectives that inform the analysis ensure the outcomes satisfy the research themes and thereby answer the research questions (Fielding 2012).

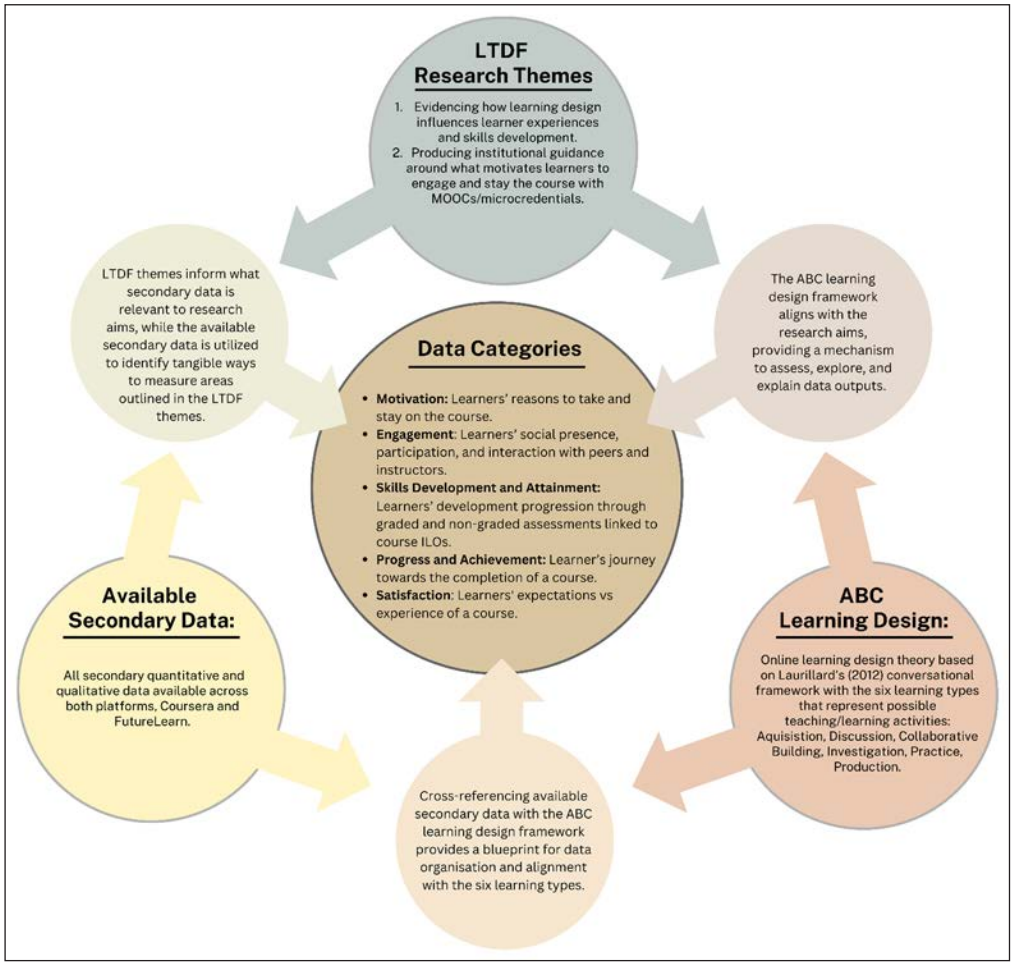

Figure 2 Triangulation Method Used for the Creation of Data Categories.

The data categories reinforce the research themes while providing reliable organisation for the secondary quantitative and qualitative data so it could be examined for patterns of agreement, convergence, divergence, or discrepancy between the inputs of course design and intended or unintended outputs of learners' experience.

In the third phase of the explanatory sequential design, the same methodological triangulation (Erzberger & Prein 1997) used to create categories and organise the data was implemented to analyse the quantitative and qualitative data, providing commonalities for data integration and context for data interpretation (Bowen, Rose & Pilkington 2017).

The results were compiled into different types of summary findings so researchers could conduct a thematic analysis of the interrelationship between ABC learning design, course structure, and learner data. First, the summary findings were organised by MOOC so results could be examined in isolation and within the context of the individual course design. Then, the summaries were organised under the categories identified in phase two, so meaningful findings within specific categories that may not otherwise be visible in isolation could be observed when

compared against other MOOCs and rule out anomalies caused by differences in the course subject matter duration, or level.

All meaningful results and reoccurring patterns identified from both summary findings, that either negatively or positively impacted the learner's journey, were extrapolated and organised into themes that correspond to components of the ABC learning design. The results section contains themes evidenced across a minimum of five courses.

2.3 INSTRUMENTS

The secondary data used in this research was downloaded directly from protected databases, such as online data analytics dashboards (Looker), internal course statistics dashboards, learner reviews (Yotpo), and research data exports. These CSV files were immediately placed in a secured folder, only accessible to the researchers. Then, the quantitative data was converted into Excel spreadsheets, organised and cleaned via Excel formulas and pivot tables, respectively. The qualitative data remained in the original CSV file format and was first uploaded in RStudio for cleaning: removing irrelevant or corrupted data as well as duplicated rows, merging datasets and ensuring NVivo compatibility by removing formatting commands (e.g., /r, /n, /t, etc.). Once cleaned, the datasets were uploaded into NVivo and grouped by type (early comments, late comments, reviews, etc.). The research team then conducted an iterative content analysis on this data, coding segments according to themes identified from the research questions, but allowing for additional emerging themes, where relevant (Toyon 2021). The frequency of codes in each dataset was then summarised and explained in Word document reports with representative examples, which allowed us to build a comprehensive picture of our results for each course.

2.4 ETHICS

This research received ethical approval from the College of Social Sciences Research Ethics Committee for Non-Clinical Research involving Human Participants/Data. All secondary data from the partnership platforms, Coursera and FutureLearn, is GDPR compliant and consent was obtained through platform Terms & Conditions at sign-up, which notified learners that data given to these platforms are subject to institutional research purposes. All secondary data analysed underwent irreversible anonymisation and de-identification.

3. RESULTS

The seven identified themes fell into one of two result classifications. Themes found under the first classification relate to the effective utilisation of individual learning types, or selectively grouped learning types, and their impact on online course design. Then, under the latter classification, the relationships between learning types and their impact on online course design are examined. Themes found in both result classifications are displayed by a description of the analysis and the subsequent impact on online course design.

3.1 EFFECTIVE APPLICATION OF LEARNING TYPES WITHIN ONLINE COURSE DESIGN

3.1.1 Quality and duration of videos (acquisition)

Analysis: The research revealed that the quality and length of video-based acquisition in an online course influences learner progression, engagement, and satisfaction with course materials. Consideration for the quality of media production, especially video content, is essential when delivering online courses to ensure that the benefits derived from having a visual medium are not overshadowed by issues, such as poor audio, lack of transcripts, or improper resolution of on-screen images and infographics (Figure 4).

Impact: While FutureLearn and Coursera track engagement with video-based content differently, the data shows a unified message that videos have a powerful impact on the learner experience, no matter the subject matter. Data was collected from over 400 videos that ranged from pre-recorded lectures to demonstrations (Figure 3). Having well-structured, high-quality videos provides additional value such as increased engagement, accessibility, and retention

(Diwanji et al. 2014) that cannot be duplicated with text-only acquisition. For example, pre-recorded lectures can deliver identical content to text-based acquisition while also boosting the facilitator's presence, providing a 'nurturing value' to learners (Koumi 2006).

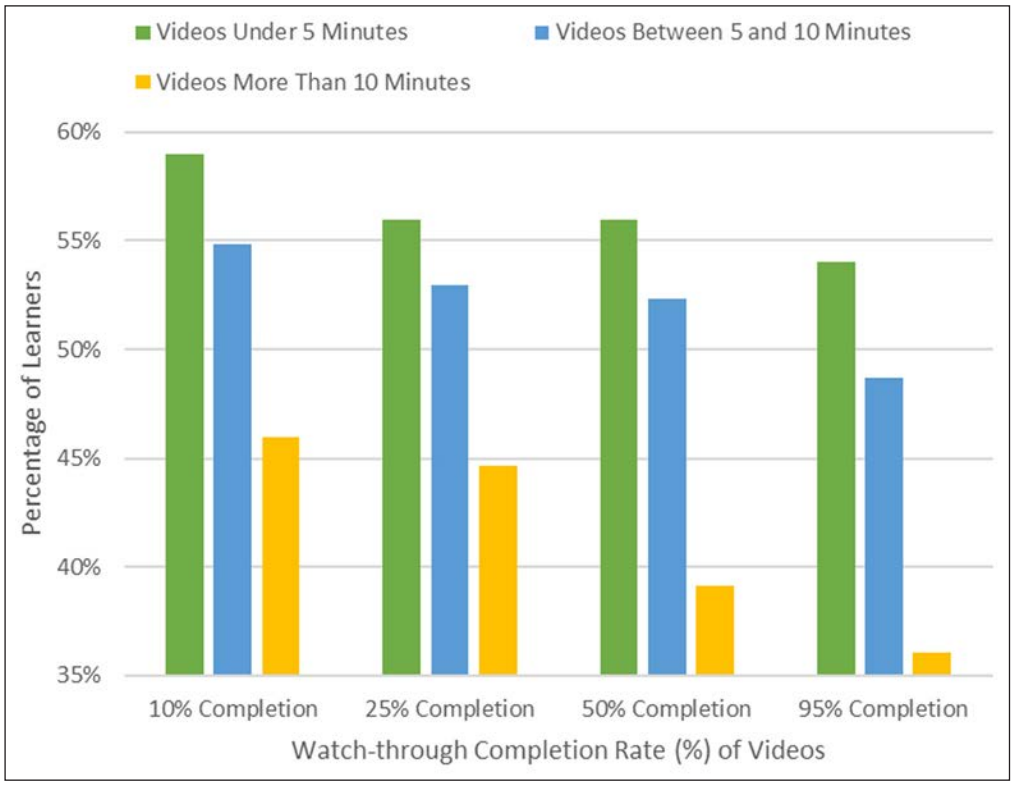

Figure 3 FutureLearn Drop-off Rate.

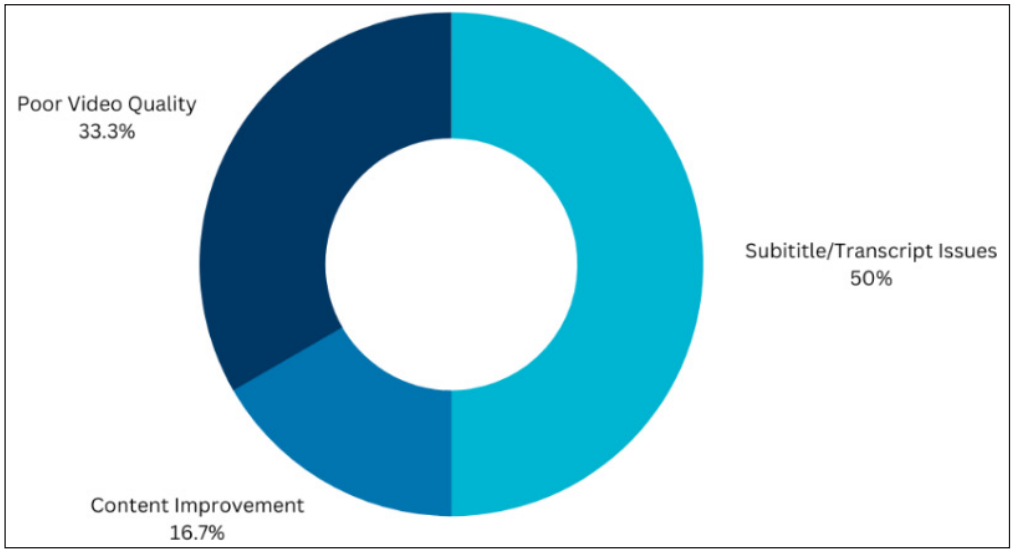

Figure 4 Reasons learners dislike videos, Coursera.

3.1.2 Distribution of step types under the acquisition learning type

Analysis: According to Borup, West and Graham (2012), when acquisition content is limited to a text-based medium, the social presence of the instructor is diminished and learners are less likely to engage, especially when topics are highly visual and/or abstract concepts. When focused solely on the spread of acquisition steps, the data revealed that, on average, the acquisition learning type consisted of 67% reading, 32% video, and 2% audio.

Impact: The distribution of the acquisition learning type has a significant impact on course completion, which is visualised in the graph below (Figure 5). The stacked bar graph compares all eight courses by displaying the composition of each course's acquisition learning type steps against their completion rates. The graph reveals that there is no significant correlation between the distribution of acquisition learning types and course completion rate (PCC = 0.24, p = 0.001). However, due to the spike in completion rate for Course B, feedback from learners

who completed the course was examined further for insight. In Figure 6, two learners reported that the blend of acquisition types (video and reading) positively impacted their experience in Course B.

While this feedback is anecdotal, given the sample size, it does align with existing research on universal online course design which advocates for providing learners with a choice in how they learn (Rao, Edelen-Smith & Wailehua 2015). This suggests that while video and audio acquisition steps might offer a more holistic learning experience, it is the flexibility and choice extended to the learners that can positively impact their engagement with the course content. For example, a learner can pause mid-reading and return to the same step at any time, but a video step, especially those over 10 minutes, can dissuade a learner from engaging. Additionally, courses with a high audio and video step count risk encountering more issues with quality and accessibility, which contributes to a negative learner experience, as shown in the previous section.

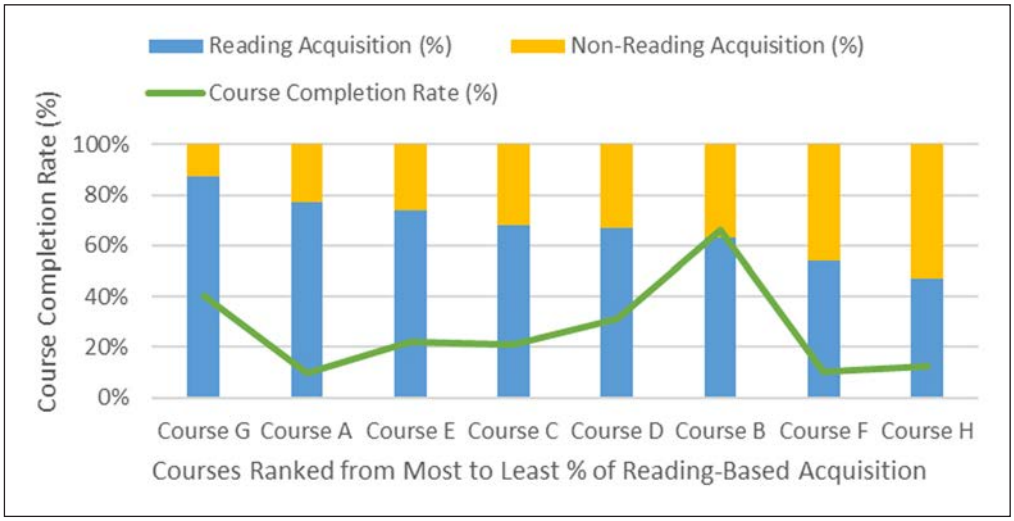

Figure 5 Acquisition Distribution Impact on Course Completion.

> *"Thank you I really enjoyed completing this course it was a great balance of video, reading and quizzes."* - **Course B**
>
> *"I really enjoyed the various types of learning strategies you used (reading, videos, discussion prompts, and peer-review). It helped to keep me interested and challenged me in new ways, which was very enjoyable."* - **Course B**

Figure 6 Quotes from Learner Feedback.

3.1.3 The link between the structure of discussion steps and course engagement

Analysis: Designing appropriate discussion prompts facilitates peer interaction, encourages learner reflection, and creates a sense of community among learners and staff. Without a set prompt, learners are less likely to engage in discussions. On average, the researched courses were comprised of 17% discussion steps. At first glance, this percentage can seem quite low considering how important the social component is for creating an engaging online learning community. However, online course design is not about hitting a quota of each learning type, but strategically utilising the learning types in ways that they can be the most impactful. Building upon the wider community of research regarding learner engagement (Gilbert & Dabbagh 2004; Martin & Bolliger 2018) the data shows that creating opportunities for learners to discuss is not enough to improve communication and collaboration, and discussions must have a clear purpose (Jaggars & Xu 2016).

Impact: Most of the engagement data collected from the research came from discussion learning type steps, as it yielded both qualitative (i.e., comments) and quantitative (i.e., response rates) data. However, it is important to note that on FutureLearn staff and learners can comment on most steps, while Coursera only allows comments on discussion prompt items. With that difference in mind, the courses were ranked from the lowest to the highest percentage of discussion step composition.

Then, to accurately compare comment engagement across all the courses, the average number of comments per learner was utilised as a benchmark, so that the results would not automatically skew favourably towards courses with more learners. Finally, a distinction was made between comments on discussion learning type steps and comments found elsewhere in the course. This strategic alignment of the data allowed for a comparative analysis to take place, showing the impact of having discussion learning type steps on overall comment engagement, as well as comment engagement within the discussion steps (Figure 7). The data illustrates that there is a statistically significant positive correlation between the number of discussion steps and comment engagement within both the entire course and discussion steps (respectively PCC = 0.66, p = 0.007; PCC = 0.86, p = 0.032). However, the data also reveals a sudden drop in comment engagement in the Coursera courses (courses A and B), which reflects the limitations of that platform because courses with similar discussion composition percentages had higher levels of overall comment engagement.

Of the three courses (Courses G, H, and C) with a composition of 13% discussion steps, Course C has a higher average of comments per learner, which could be attributed to the inclusion of response examples to discussion prompts, clear guidance, and a stronger facilitator presence in the comment section.

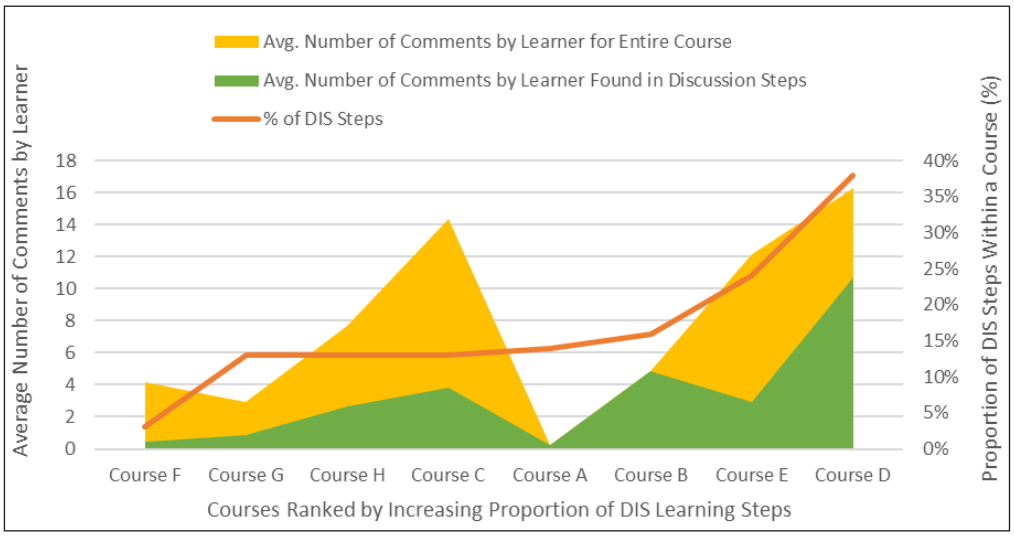

Figure 7 Increased Engagement Caused by Discussion (DIS) Learning Types.

3.1.4 Writing effective guidance for student exploration (investigation)

Analysis: Investigation learning type steps often reside within reading, discussion, and exercise steps, where the learner is tasked with applying knowledge gained from the course to navigate data repositories, compile reliable information from web searches, and evaluate linked external resources. Out of the eight courses researched, six courses contained steps built around the investigation learning type. While it is still practical for educators to create a Community of Inquiry (Garrison & Arbaugh 2007) by asking students to search the web, review and critique online sources, or evaluate ideas, educators may find it difficult to effectively instruct learners, especially if the task involves the use of unfamiliar digital tools. By examining comment engagement within investigation steps, the impact of effective guidance can be measured and evaluated.

Impact: Since investigation steps do not have a significant influence on overall course comment engagement, only comment data found within the investigation steps were examined to reveal areas of effective and ineffective guidance. When comparing courses with similar percentages of investigation steps (Figure 8) such as course G (4%) and course H (5%), the data reveals that course G contains 9% of the distributed comments on investigation steps and course H only contains 0.4%. The same can be seen in other courses with similar percentages of investigation

steps (Courses E and F), yet course E has 34% of the distributed comments on investigation steps and Course F only contains 4%. This data alludes to a positive correlation between the utilisation of investigation steps and comment engagement however, the results were not statistically significant (PCC = 0.84, p = 0.236).

These noticeable differences can be attributed to a few factors, such as the guidance provided by the educators within the investigation steps. In courses G and E, the guidance given to learners is specific and consistent. Educators in these courses posed exploratory questions within the platform and in instances where they required learners to use an embedded e-tool or access an external platform, they repeated the instructions multiple times, to keep learners focused and on task. In Course H and Course F, learners are still encouraged to explore, but there are fewer prompts, and in some investigation steps, there are none (Figure 9). This stresses that while having a greater percentage of investigation steps within a course will likely mean that the same course will house a greater portion of distributed comments, it does not translate to an investigation learning type being used successfully. It is the cognitive tasks, such as responding to questions, critical thinking, and analysing information, that truly reinforce learner understanding in investigation steps (Keengwe & Kidd 2010).

However, another factor that could be contributing to the lower engagement with investigation steps is the subject matter, as Courses H and F are Data Science and Computer Science disciplines, respectively. These disciplines may require additional pedagogical scaffolding around exploratory activities because they are more likely to utilise e-learning applications and external resources outside the primary course platform.

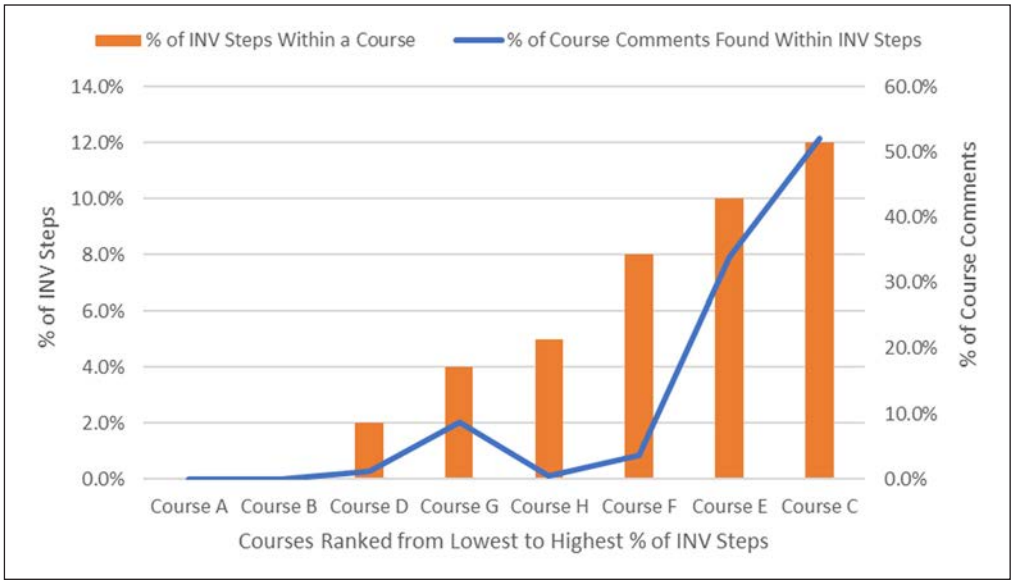

Figure 8 Impact of Effective Investigation (INV) Steps on Engagement.

"It has given me a very solid framework from which to build an ongoing reading programme as well as highlighting some truly exceptional online sites which I'm able to spend time on to further consolidate my learning. I thought it was well paced, very good information and questions at every step as well (as noted above) very good further reading/exploring options at every stage." – **Course E**

"A lot of materials are given in writing form or with links to research papers, which is not bad for me. But the explanation of [topic] could have been done with more examples and more hand[s]-on projects." - **Course F**

Figure 9 Quotes from Learner Feedback.

3.1.5 Balancing assessment and feedback opportunities on short courses (practice and production)

Analysis: Consideration of course ILOs when developing practice and production learning type steps is critical to ensuring that, whether a course is skills-based, knowledge-based, or a mixture of the two, learners are assessed correctly and given formative opportunities to demonstrate their comprehension of the ILOs. When existing practice and/or production steps are aligned with the course level and ILOs, learners are more likely to complete the assessments and achieve the ILOs of the course. When they are misaligned to the course level or ILOs, learners struggle with the assessments and are less likely to attempt them, contributing to a higher attrition rate around assessment points.

Impact: To assess the impact of practice and production learning type steps, the course completion rates and the total number of assessment opportunities per course were aggregated, which included all graded and un-graded assessment opportunities. When assessment opportunities were compared to the completion rates of each course, there was a statistically significant negative correlation (PCC = –0.31, p = 0.005) between the total amount of combined assessment opportunities and course completion rates (Figure 10).

The data revealed that the number of assessments within a course, especially a short course, has a noticeable impact on the course completion rate for the researched MOOCs. When there are too few assessment opportunities, learners miss out on receiving feedback and benchmarking their progress in measurable ways, which can diminish their motivation to complete the course and result in 'unrewarded learning' (Savin-Baden 2004). When assessment opportunities are not 'practical within a MOOC's environment' or timescale, learners can be discouraged as they feel overwhelmed with a workload that is misaligned to the course level (Yousef et al. 2014).

Finding an optimal balance of assessment opportunities can contribute to keeping course completion rates high while supporting the knowledge and skills attainment outlined in the course ILOs. The results from the data align with elements of the pedagogical strategy of Sustainable Assessment (Boud 2000; Boud & Soler 2015), which states that assessments should 'meet the needs of the present and [also] prepare students to meet their own future learning needs'. Meaning that, while staff should consider future learning needs when designing assessments, they also need to consider appropriate timescales for learners to operate within. In Figure 11, qualitative learner feedback from Course B, reveals that the quizzes and exercises positively impacted learner experience and contributed to building skills, while learner feedback from Course H reveals that the exercises were challenging, not adequately supported by course resources, and possibly misaligned with the course level.

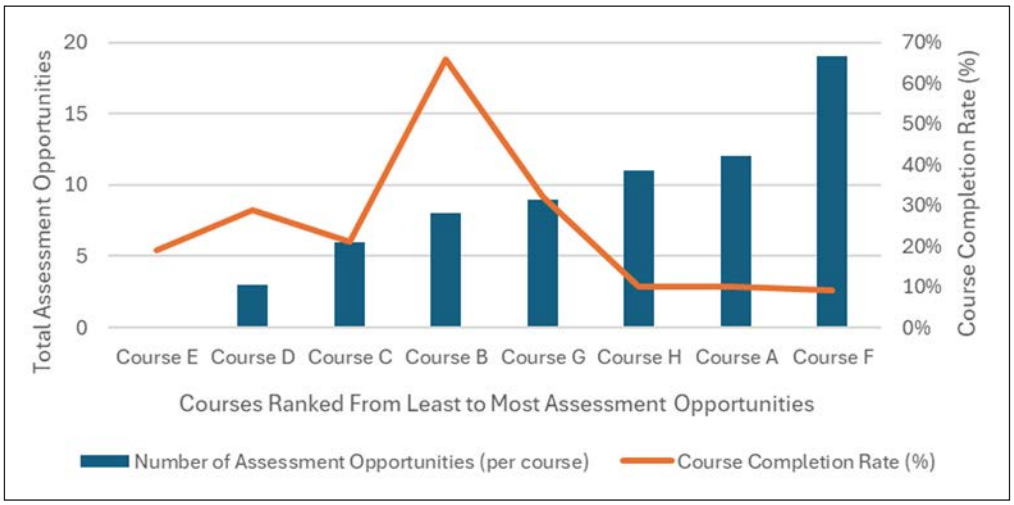

Figure 10 Assessment Opportunity Impact on Course Completion Rate (%).

> *"From the videos, exercises and quizzes I gained a lot of knowledge and skills to become a sensible and effective leader … the exercises … are helpful and beneficial in building my leadership skills."* – **Course B**
>
> *"Perhaps more support needed for the Week 3 exercise it was quite challenging. I noticed that not many participants completed the practical task (like me). If I had a printable guide to the [redacted] elements I would have not given up on the task as quickly, but I didn't even get a set uploaded."* – **Course H**

Figure 11 Quotes from Learner Feedback.

3.1.6 Appropriate utilisation of e-learning tools and plug-ins (practice, production, collaboration)

Analysis: E-learning tools and plug-ins are often used when developing practice, production, and collaborative building learning types because they allow educators to expand beyond the limitations of VLEs regarding assessments, practice environments, and online forums. Both platforms have the capacity to support external tools that facilitate a wide range of virtual activities, which is a key pedagogical consideration for online course design when selecting a platform to house a course (Zhao, Sintonen & Kynäslahti 2015). From plug-ins that render coding simulations for data science courses to external wikis filled with resources for humanity courses, these tools allow educators to enrich their delivery. Of course, educators must take into consideration the suitability of the tool, the task, and the platform.

Impact: The researched courses were separated by platform because Coursera and FutureLearn monitor plug-ins and e-learning tools differently. For Futurelearn, step completion and the course duration data provided a way to consistently track learner progression across the courses. In the first graph below (Figure 12), four FutureLearn courses are displayed. Of these four courses, there were a total of 35 steps with instances of plug-ins or e-learning tools. Because the courses have different durations, between two weeks and six weeks, the duration of every course is shown in percentages. Then, six instances of plug-ins or e-learning tools that corresponded to the highest and lowest step completion rates were flagged. The data illustrated that when utilised appropriately, e-tools provided a positive impact on learner experience that kept step completion consistent throughout the course. However, when used improperly, e-learning tools had a negative impact on learner experience and resulted in lower step completion. In one instance, improper deployment of an e-learning tool lowered step completion to 63% in Course G.

Turning to Coursera, the impact of utilizing internal and external e-tools for assessments was investigated by examining item feedback for learner-reported assessment satisfaction. After reviewing the learner-reported satisfaction (number of likes) for formative, summative, and plug-in assessments, it was clear that plug-ins had the lowest percentage of satisfaction being reported, with most of the feedback accompanied by qualitative data that detailed instances of technical issues (Figure 13). The combined data from both platforms provide three main reasons linked to the drops in step completion: technical issues, misalignment between the activity/assessment and the course's ILOs, and unclear guidance on how to access the E-Learning tool.

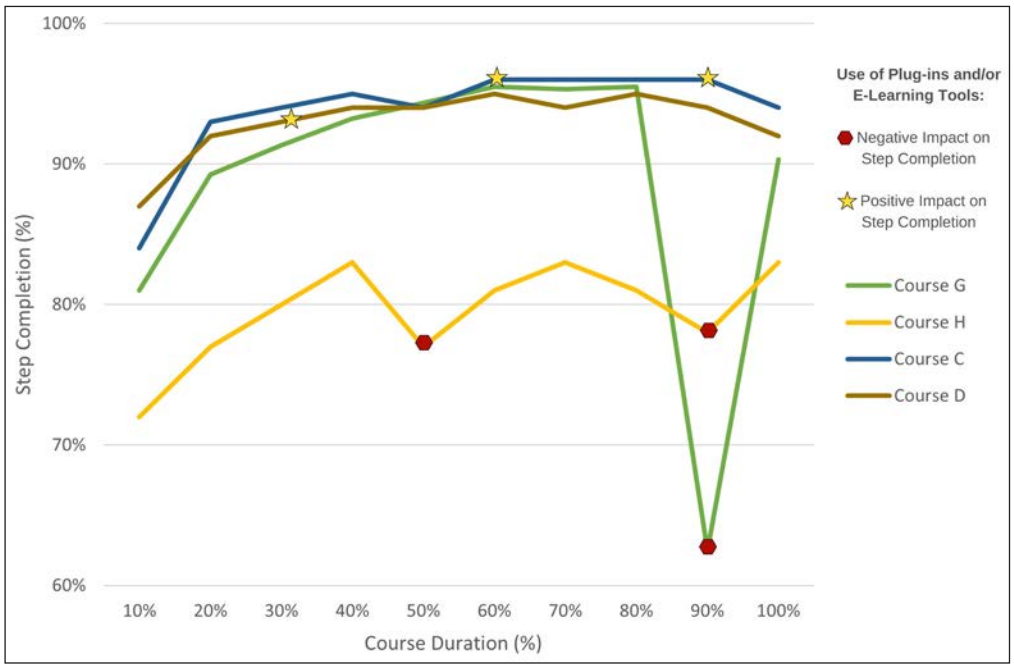

Figure 12 Impact of Plug-ins and E-Learning Tools on Step Completion Rates (%) on FutureLearn Courses.

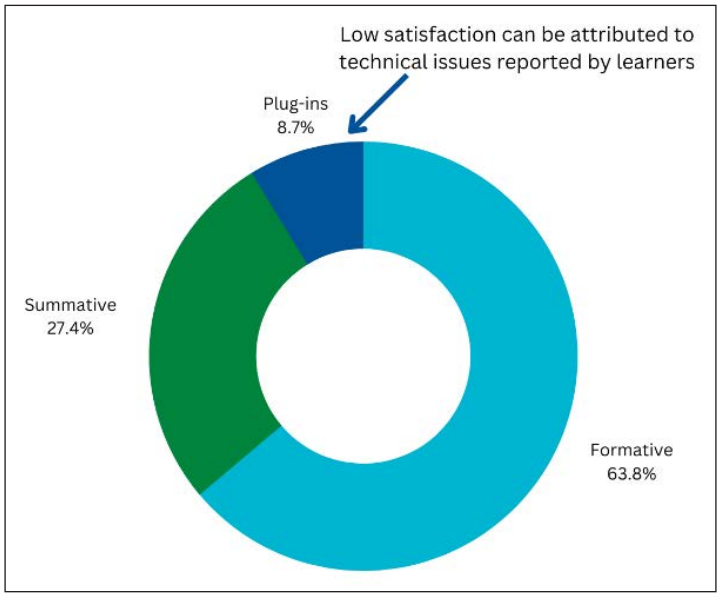

Figure 13 Coursera Item Feedback: Learner Satisfaction with Assessment Types (%).

3.2 SUCCESSFULLY LEVERAGING THE SYNERGIES BETWEEN THE LEARNING TYPES IN ONLINE COURSE DESIGN (FREQUENCY AND SEQUENCING)

Analysis: In this final section on examining the learning types, the focus will shift from the effective and appropriate utilisation of individual and grouped learning types, to leveraging the relationships created from the strategic building and sequencing of the learning types. The research into understanding the pedagogical impacts of the learning types reveals that successful online course design relies on harnessing the synergies that exist between multiple learning types, and not just the successful implementation of individual learning types. Because the common aim of the learning types is to enrich pedagogical conversations that inform course design (Laurillard 2012), harnessing the 'potential synergistic relationships' between the learning types can enhance the overall effectiveness of the ABC learning design (Jayashanka, Hewagamage & Hettiarachchi 2018). The data revealed two main strategies, frequency and sequencing, that are conducive to unlocking the synergies that exist between learning types.

To achieve a harmonised frequency of learning types, the course composition should align with the course ILOs and utilise all learning types, avoiding any inconsistent distribution of the learning type so learners can benefit from a holistic and comprehensive experience without being overwhelmed. In courses where the learning types are sequenced in a way that builds up to or reinforces larger activities and assessments, learners benefit from connected and coherent pedagogical design that increases course completion.

Impact: When educators included ILOs, frequency, and sequencing considerations, their course produced more positive impacts for learners (Figure 14). The research observed that coordinated frequency and sequencing of learning types influenced several key factors, such as course completion and assessment pass rates.

For example, courses with the highest completion rates (above 30%) and satisfaction scores (above 4.7 out of 5 stars) had an even distribution of learning types that aligned with the ILOs but also implemented additional frequency strategies such as including no more than four steps between each discussion learning type and ensuring that each week of the course keeps a consistent design structure, which contributed to rich exchanges between learners and stable retention rates, respectively.

In courses with instances of sequencing, the data reveals higher assessment pass rates (above 90%) and an increased self-reporting by learners of gaining new knowledge or skills (above 95%). The most impactful example of sequencing occurred around assessments, with two courses implementing a unique pattern of production, practice, and then acquisition learning types that allows learners to produce a complex output, followed by a practice activity where they are quizzed over their understanding of what they have produced and an acquisition activity where learners are given a summary explanation with additional resources to review the topic.

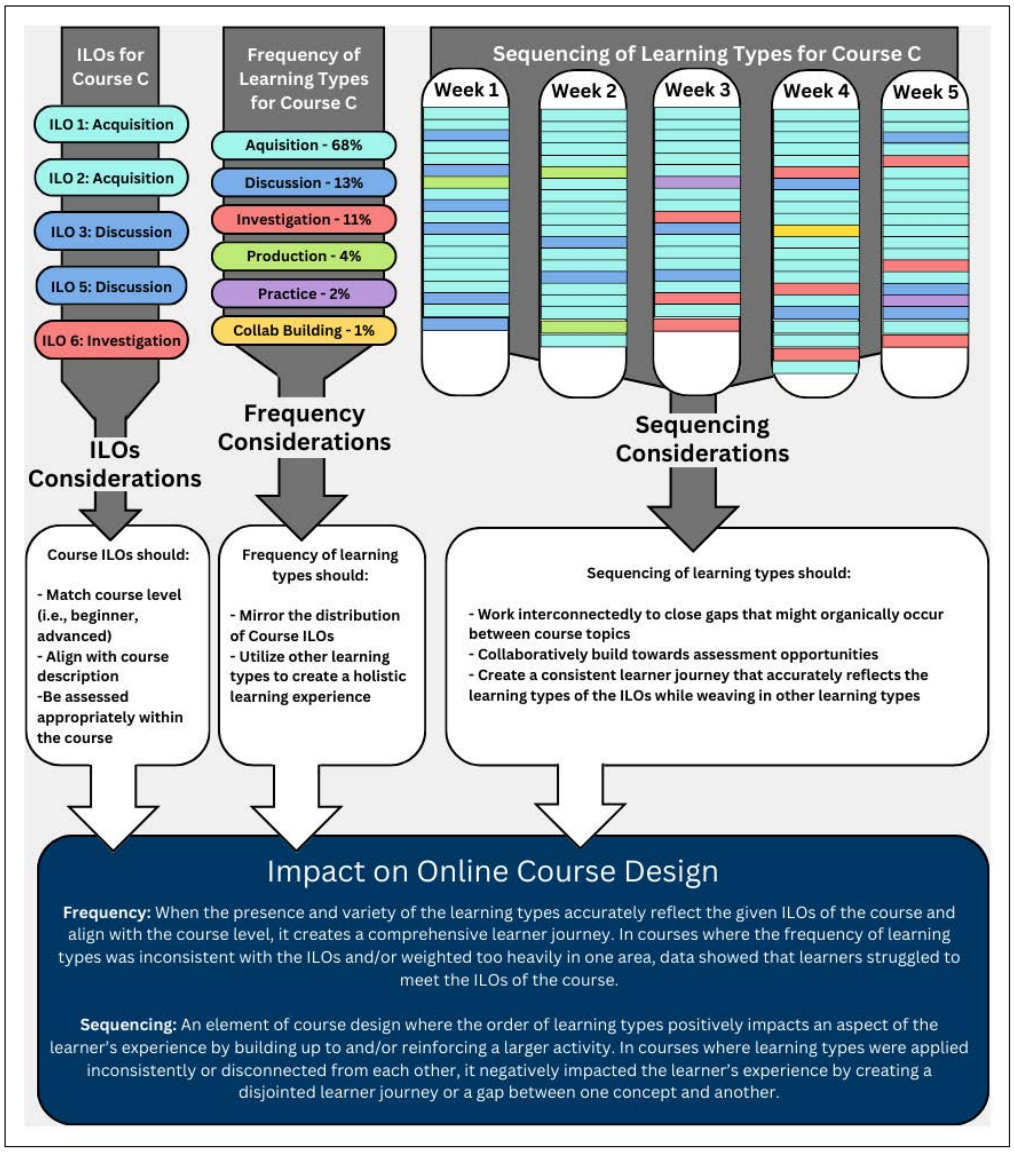

Figure 14 Impact of Frequency and Sequencing of Learning Types (Course C).

4. DISCUSSION

4.1 QUALITY AND DURATION OF VIDEOS (ACQUISITION)

Based on the research results and existing research on video-based engagement (Dobrian et al. 2011; Harrison 2019), videos that are under 5 minutes in duration, with a clear and concise message, moderate to high production quality, and complete transcripts, contribute to the

optimal learner experience. Videos delivered under this guidance are received by learners as accessible forms of media in a digestible size, resulting in higher percentages of watch-through rates and increased engagement with video-based acquisition steps.

Videos that were regarded as challenging or disruptive to the learner's experience tended to be videos that were approaching or over 10 minutes in duration, had a poor visual or audio resolution, or for which transcripts were either incomplete or missing. The data from these negatively reviewed videos showed that, without the above considerations, learners are less likely to watch videos to completion and more likely to cite poor video quality or lack of transcripts as an accessibility detractor for the course.

4.2 DISTRIBUTION OF STEP TYPES UNDER THE ACQUISITION LEARNING TYPE

When creating online course content focused on the acquisition learning type, it is recommended to blend mediums, such as video lectures, podcasts, or articles in a meaningful way. While the results in this area of research did not indicate a significant correlation, having these options available to learners prevents single-medium fatigue, extends flexibility, and improves the instructor-learner relationship (Borup, West & Graham 2012). For example, providing audio steps allows learners to access the course more easily if on a mobile device, and having video steps can show 3-D visualisation content that would not easily translate to text-only content. By considering the application of acquisition-based steps and reflecting on the learner experience, instructors can maintain a balance of acquisition types, which could positively impact assessment scores and knowledge retention (Moen 2021).

4.3 THE LINK BETWEEN THE STRUCTURE OF DISCUSSION STEPS AND COURSE ENGAGEMENT

Fostering an online community for learners can be challenging given the nature of asynchronous education, but the inclusion of purpose-driven discussion learning type steps can provide opportunities for learners to engage with peers and educators while applying their knowledge from the course (Martin & Bolliger 2018). The data from this research confirms that there is a positive correlation between having structured discussion steps and overall comment engagement when utilised consistently within a course. To get the most from discussion learning type steps, staff should set clear instructions, with examples and reasons to collaborate with peers, and facilitate discourse in the discussion sections.

4.4 WRITING EFFECTIVE GUIDANCE FOR STUDENT EXPLORATION (INVESTIGATION)

The key to appropriately utilising the investigation learning type is providing effective guidance that provides a method and a reason to explore. By including guidance that assists in a problem-solving activity, learners are more likely to produce accurate and relevant solutions (Loibl & Rummel 2013). Data from this research indicates a positive but not statistically significant correlation between the inclusion of investigation steps with well-defined instructions and engagement within the course. Additionally, when courses deploy the use of external resources or databases, there should also be points of instructional reinforcement along the way to keep learners on track.

4.5 BALANCING ASSESSMENT AND FEEDBACK OPPORTUNITIES ON SHORT COURSES (PRACTICE AND PRODUCTION)

Wider research suggests that placing assessment opportunities throughout a course not only helps learners achieve the designated ILOs, but also provides a source of motivation for learners to complete the course (Savin-Baden 2004). When learners can see improvement in their understanding or skills, or receive helpful feedback to improve their performance, they are more likely to finish the course. However, if learners are faced with over-assessment, they can experience assessment fatigue and are less likely to finish the course. This research identified a statistically significant negative correlation between the total amount of assessment opportunities and course completion rates. When designing assessment opportunities for online courses, educators should factor in the level and duration of the course and confirm constructive alignment between the course ILOs and content (Stamov Roßnagel, Fitzallen & Lo Baido 2020). Additionally, ensuring that the placement and delivery of formative and summative assessment opportunities are designed thoughtfully, can keep learners motivated.

4.6 APPROPRIATE UTILISATION OF E-LEARNING TOOLS AND PLUG-INS (PRACTICE, PRODUCTION, COLLABORATION)

Based on the results of this research, appropriate utilisation of e-learning tools and plug-ins can be achieved by ensuring the e-tool has been rigorously tested within the intended platform, aligns with course ILOs, and is always paired with guidance. Additionally, other research into using e-learning tools in HE indicates that considerations for digital accessibility requirements should always be factored in when selecting e-tools so learners can leverage the tool as intended, without barriers (Aljawarneh, Alnsour & Muhsen 2010).

4.7 SUCCESSFULLY LEVERAGING THE SYNERGIES BETWEEN THE LEARNING TYPES IN ONLINE COURSE DESIGN (FREQUENCY AND SEQUENCING)

The results from this section highlight that even when individual learning types are deployed correctly, leveraging the coherent frequency that allows for practice, discussion and knowledge acquisition to be symbiotic, often returns a cohesive learner journey and can mitigate against any gaps that may exist between one concept and the next. Furthermore, case studies into the ABC learning design method have noted that a holistic approach where the relationship between learning types is leveraged, produced effective overarching assessments (Shé et al. 2020) and identified learning technologies that could be integrated across several learning types (Evers 2018).

5. LIMITATIONS

We acknowledge that the study may contain some limitations. One identified by the authors is that only eight courses were studied, and all are exclusively Glasgow University courses hosted on the FutureLearn or Coursera platforms. This research could be strengthened by applying the methodology to a wider selection of courses that span different institutions and platforms. Another accepted limitation is the potential for author bias. The authors were instrumental in the development and design of these courses. Although the methods and instruments used were chosen to limit author bias and create awareness of the existing theoretical orientation that predicates the research design, we acknowledge it may exist when handling secondary data (Baldwin et al. 2022).

To fully evaluate the transferability of the findings, the authors suggest that a cross-institutional study takes place. We would therefore welcome the opportunity to work with other institutions to undertake the same analysis using the same methods to add further validation to our findings.

6. CONCLUSION

By analysing the available secondary quantitative data, such as completion rates and engagement metrics, patterns emerged that could be further contextualised through relevant secondary qualitative data. When examined through the lens of the ABC learning design method, the research findings offer valuable evidenced-based explanations as to why and how the implementation of effective learning design can significantly impact the online experience of learners. It is clear from this research that effective learning design and design sequencing contribute to increased learner participation, motivation, and overall course satisfaction.

In addition to uncovering what design principles reinforce the intended outcomes of a particular learning type or activity, the results also revealed that the relationships between learning types can be harnessed to provide a more holistic learning experience. The guidance given under the results section of this paper provides meaningful instruction that can help lower the barriers learners encounter in online learning. By using this research as a guide, colleagues can confidently develop their online material to ensure a well-balanced and structured learning experience for the online learner.

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COMPETING INTERESTS

The authors have no competing interests to declare.

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