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Article

Understanding Online Learner Engagement and Course Completion: A Theoretical Review of Content Design Factors, Learner Behaviour Patterns, And Dropout Determinants

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Abstract: According to research, online education platforms have signed up hundreds of millions of online learners with low course completion rates. The completion rates of MOOCs (Massive Open Online Courses) are consistently between 5% and 15%. In this paper we synthesize foundational and current literature on the factors that influence completion of online courses and combine these factors with the behavioral component of learner engagement, design of online course content, and the barriers to course dropout. Based on the above, we develop an integrated conceptual structure for the completion of online courses and set the groundwork for the appropriate use of K-means clustering and Spearman's rank correlation to the behavioral data of online course participants. In this paper we provide a research design that will lay the foundation for a subsequent primary study that will address the online education gaps identified herein

Keywords: online learning, course completion, literature review, engagement, dropout, content design, self-determination theory, metacognition, K-Means clustering, Spearman correlation

1. INTRODUCTION

The rapid growth of digital learning platforms like Coursera, Udemy, edX, LinkedIn Learning, and their global equivalents have rapidly redrawn the global education map. Offering millions of courses and hundreds of millions of enrolled learners, digitized platforms have fully opened pathways to accessible higher education and skills training like never before. Even learners in remote and geographically isolated, as well as economically underprivileged and educationally underserved, communities now have access to high-end learning for little to no cost.

While this might be seen as a reasonable trade-off, this widespread educational availability continues to produce a chronic problem - millions of unintended, unengaged enrolled learners. The completion rates of 5% to 15% are often cited for MOOCs, and the self-paced, informal courses of commercial learning platforms are only slightly better. This represents a significant challenge. Widespread uncompleted courses negatively impact the Return on Investment of enrolled learners and their employers, educational platform operators, and public learning systems.

Despite augmentations to user interfaces, content, and instructional design, the significantly low completion rates indicate a structural barrier. This review aims to address the challenges posed by the behavioral and cognitive engagement of learners with content within the constraints of time, motivation, and social support.

1.1 Purpose and Scope of this Review

This paper reviews the existing literature, both theoretical and empirical, on the engagement of online learners, course dropout, content design, and course completion. It seeks to accomplish two goals. The first is to describe the state of the art of the causes of dropout and completion in online learning systems. The second is to identify the existing knowledge gaps that will motivate and guide a planned empirical primary study as the next phase of this research programme.

The review is structured by five topics. They are (i) theories of dropout and persistence; (ii) the dimensions of engagement and the outcomes associated with the dimensions; (iii) content design: length of videos, interactivity, and scheduling; (iv) metacognitive and self-regulative learning; and (v) the techniques and methods of analysis to segment learners and predict outcomes. As a result of the review, an integrated conceptual model and a design for research have been included.

1.2 Research Questions

The planned empirical study will be guided by the following research questions:

1. What learning and engagement patterns characterize the users of online courses?
2. What content design features (video length, interactivity, course design, etc.) relate to higher course completion?
3. What are the primary motivational and structural obstacles to course completion?
4. Do groups of learners who can be identified and defined by different criteria show different course completion and outcome behaviors?
5. Which participation behaviours show statistically significant positive correlations with self-reported learning outcomes?

2. THEORETICAL FOUNDATIONS

2.1 Tinto's Model of Student Departure and Online Adaptation

The basis for understanding the departure of learners from educational programs is found with (Tinto, 1975)model of student departure. This model, which considers the departure of students from traditional, residential, higher education programs, conceptualizes student retention as a function of the extent to which students are integrated into the academic and social fabric of the institution. Students who develop social ties with students and faculty, and who develop a sense of belonging to the institution, depart to a lesser extent than those who remain socially isolated.

The model has been adapted to suit online education (Rovai, 2003); (Boston et al., 2019)). Compared to campus-based educational programs, online students are at a considerable disadvantage in the dimension of social integration, because of the asynchronous and geographically distributed participation, coupled with the virtual (and often, anonymous) nature of participation in MOOCs. This social integration deficit provides a structural explanation for the disengagement of online students, especially the disengagement of those students who are academically capable and self-motivated. Thus, the design and development of online educational programs should feature virtual social integration mechanisms, such as social networking and collaborative learning, which should be considered essential for the retention of students, rather than desirable but non-essential features.

2.2 Self-Determination Theory and the Motivation Continuum

The nature of motivation of participants in online education is best described using the Self-determination theory ((Deci & Ryan, 1985); (Ryan & Deci, 2000)). SDT describes the continuum of motivation from complete amotivation through a range of extrinsic and intrinsic forms of motivation, to fully intrinsic motivation, which describes the higher end of the continuum of motivation. SDT identifies the needs for autonomy, competence, and relatedness as important for the development of intrinsic motivation.

Online learners with intrinsic motivation, curiosity, and a desire for growth and self-improvement tend to have higher levels of course persistence, even when faced with challenges or competing priorities. On the other hand, learners who take a course for external purposes, such as a course mandated by an employer or a course taken to finish

a requirement or as a result of social pressure, will have higher levels of course dissatisfaction and a higher tendency to withdraw from the course when their external purpose is not met. Because of this type of motivation, learners who have similar demographic characteristics can have starkly different completion rates for the same course.

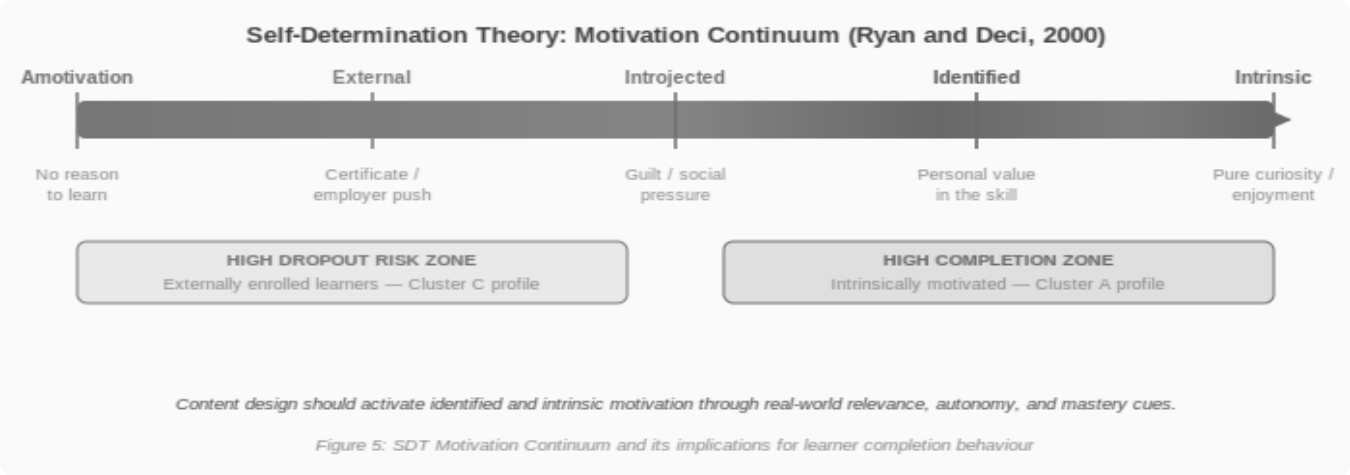

Figure 1: Self-Determination Theory Motivation Continuum and implications for learner completion behaviour (Source- (Ryan & Deci, 2000))

To meet the design implications of the self-determination theory, courses need to support the three primary motivational needs. These are, the need for autonomy through self-paced and self-directed courses, the need for competence through the gradual and scaffolded course activities that include ongoing feedback, and the need for relatedness through social interactions and an instructor presence. Courses that support inflexible self-pacing, provide feedback only at the end of a module, and have no social dimension to the course, will undermine learners' intrinsic motivation.

2.3 Learner Heterogeneity: The Kizilcec Typology

(Kizilcec et al., 2013) made an important contribution to the dropout literature by using behavioural logs to analyze the first generation of the edX courses and showing that not all online learners are a homogeneous population. Based on their analysis of user behavior, they identified four primary types of online course participants: Completing, Auditing, Disengaging, and Sampling.

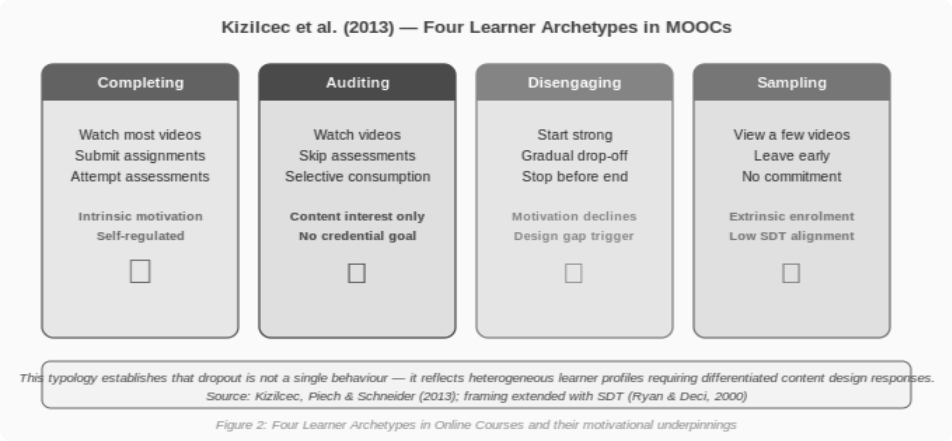

Figure 2: Four Learner Archetypes in Online Courses - motivational underpinnings and design implications (Source- (Kizilcec et al., 2013)

This typology has profound implications for both research methodology and content design. For research, it establishes that aggregate completion statistics conceal more than they reveal - a course with a 10% completion rate may have 40% of enrolled learners actively auditing, a very different situation from one where 90% disengaged in the

first week. For content design, it establishes that single-track course structures are fundamentally misaligned with the diversity of learner goals: completing learners need sustained challenge and feedback, auditing learners need accessible non-assessed content, disengaging learners need re-engagement triggers, and sampling learners need rapid value demonstration in early modules.

3. ENGAGEMENT DIMENSIONS AND LEARNING OUTCOMES

3.1 The Tri-Dimensional Engagement Model

This typology has significant implications for both research methodology and instructional content design (Fredricks et al., 2004). For research, it shows aggregate completion statistics they provide limited explanatory value. For example, a course with a 10% completion rate could have 40% of enrolled learners actively watching, which is a different situation than a course where 90% disengaged in the first week. For content design, single-track course structures represent a significant misalignment with learners' goals. The implications are as follows engaged, auditing, disengaged and sampling learners would represent in the content design structure. Engaged learners would need sustained feedback and challenges. Auditing learners would need non-assessed, available content. Disengaged learners would need triggers to reengage, and sampling learners would need rapid value demonstration in early content.

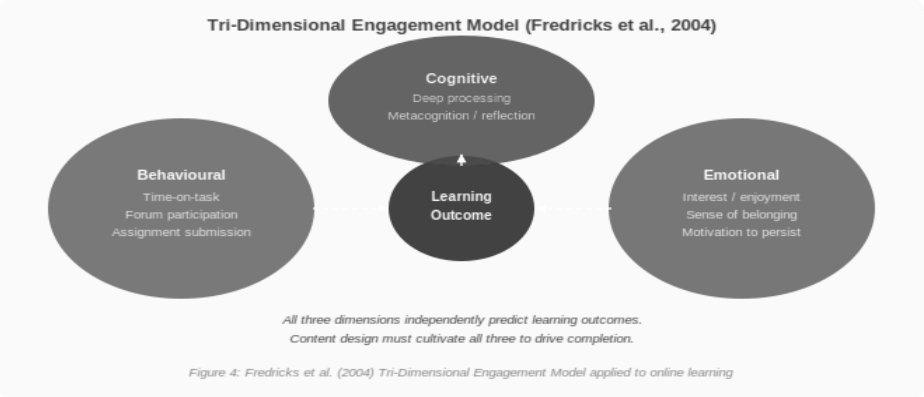

Figure 3: Tri-Dimensional Engagement Model (Fredricks et al., 2004) applied to online learning contexts

The main idea of this model is that high behavioural engagement such as viewing videos in their entirety, or submission of assignments does not guarantee learning in the same way that completing the requirements does, or indicate the likelihood of task completion. Someone who may have completed every engagement video at twice the speed and without doing the provided exercises to reflect or apply may be highly behaviourally engaged, while cognitively and emotionally disengaged. On the other hand, someone who only selectively views videos, but immediately applies what they learned in the videos to the work problems that they are trying to solve, may have far better learning results, despite having lower behavioural engagement. This separation of behavioural engagement from the learning task has significant consequences for the analysis of the platform data, as well as what Engagement-Centric Content (ECC) is designed to stimulate.

3.2 Metacognition and Self-Regulated Learning

(Pintrich & De Groot, 1990) first connected self-regulation and academic performance in the area of cognition, showing that learners who design and manage their learning process have much better performance than those who do not. This reflects the situation in online learning. Here, self-regulation is of even greater importance due to the absence of the external reinforcement of the traditional educational institution -- attendance, class scheduling, peers. The online learner must control the structure, pace, and accountability for learning.

(Zimmerman, 2002) self-regulated learning model includes three phases: forethought, performance, and self-reflection. Each of these phases has distinct components, such as goal-setting, self-monitoring, and self-evaluation. Self-directed learners benefit from setting their own deadlines, tracking their progress, and reviewing their learning. Learning in this manner is much more likely to help learners reach their desired outcomes when compared to learners taking an online course without direction. Each of these phases has components, and when taking an online course, measuring self-regulation helps in studying the outcomes of that online course.

3.3 The Practice Testing Effect

One of the most significant findings reported by Roediger and Karpicke (2006) concerns retrieval practice is the effect retrieval practice has on long-term retention. In their study, they found it was much more beneficial for study participants to take a test and recall the information than to simply study the information a second time. This effect is amplified when time between the study sessions is lengthened. The missing piece that participants in the study do not understand is in the brain itself, and it relates to the state of the memory. Active retrieval of the information solidified the memory, whereas passive exposure to the information fragmented and weakened the memory.

Online course design and this study interact easily, as the study says the best way to facilitate learning and retention is to embed low-stakes quizzes throughout the course, rather than reserving all course evaluations to the end of the course. The interactive components of a learning module that require participants to either recall or evaluate information are far better than letting the participants passively engage.

4. CONTENT DESIGN FACTORS AND LEARNER ENGAGEMENT

4.1 Video Length and the Micro-Learning Paradigm

One of the easiest things to measure in terms of content design within online learning is the length of videos. The most well-known study on this aspect is by Guo et al., (2014). This study analyzed engagement data of 862 videos and gathered data from 6.9 million video watching sessions spread over four edX courses. They found that video engagement negatively correlated with the length of the video with the most drastic drop occurring between 6 and 9 minutes. The median engagement for videos shorter than 6 minutes was significantly higher. For videos longer than 12 minutes, viewers dropped out even in the early moments of the video.

Supporting the findings of Guo et al., (2014). , the micro-learning design paradigm suggests that a learning module may contain content that is between 5-15 minutes long. Each of these modules is meant to achieve one learning objective. This design, along with the findings of cognitive psychology, supports the use of shorter learning modules in online learning as most of the video learning modules are completed by the learners during the short gaps in their schedules.

4.2 Cognitive Theory of Multimedia Learning

(Mayer & Moreno, 2003) CTML creates a framework for organizing online video to enhance learning. CTML incorporates aspects from dual-coding theory (Paivio, 1990) and cognitive load theory (Sweller, 1988). With respect to CTML, learners allocate cognitive resources to auditory and visual information through distinct channels. Segmentation (providing content in learner-paced segments), signalling (emphasizing important information), weeding (removing extraneous information), and concrete examples are CTML design principles to reduce extraneous cognitive load. Extraneous cognitive load refers to cognitive resources devoted to the design of the material and not the content of the material and, therefore, needs to be minimized.

CTML principles have a direct effect on the production of videos. For example, videos of instructors that are just lecture-style instructor videos, long lectures with no breaks for concept checks, and slides that are heavily filled with text all fail to honor design principles, and learning suffers as a result. In contrast, narrated animations, worked examples with verbal commentary, and videos that contain concept checks designed to be brief all follow the principles of CTML, and learning is positively impacted.

4.3 Interactive Elements and Formative Assessment Design

Interactive elements (embedded quizzes, reflective prompts, branching scenarios, discussion triggers) bring about multiple benefits. They stimulate retrieval practice, elaborative processing, and provide motivation, competence feedback, and a sense of agency and progress. Discussion-based interactions sufficiently bridge the relatedness deficit and stimulate the extrinsic-to-intrinsic motivation shift identified by SDT.

The body of evidence supporting the addition of interactive elements to online courses is positive, if somewhat mixed. For instance, the addition of concept checks to video lecture segments, in which interactivity is spaced every 5-7 minutes, improves retention compared to lectures that do not integrate concept checks. Real-world application exercises and branching scenarios fulfil the applied relevance tier of motivation in SDT. Conversely, the perception among learners that assessments are punitive, misaligned with course content, or of a high stakes nature, will increase learner anxiety and discourage the exploratory learning that is required to mitigate the apprehension of creative risk.

4.4 Release Schedules: Flexibility versus Structure

Designing online courses requires balancing learner flexibility with sufficient instructional structure from the need to balance flexible schedules and course structures that provide a degree of situational control to learners. (Ghazali et al., 2020) found that learners are significantly more likely to drop out of fully self-paced courses (i.e., courses with no due dates) as compared to those that incorporate soft due dates. Incorporating a self-paced, soft deadline clearly supports the self-regulation of learners and provides a low pressure, situational control to increase learning persistence.

Strong evidence supports a hybrid model. This means that core content combines flexible availability with optional 'soft' deadlines, which are suggested as milestones rather than 'hard' deadlines, and paired with progress dashboards that display learners' progress, so that learners can self-regulate their pace of completion. This model offers the structure that learners on the lower end of the self-regulation continuum require in order to engage with learning consistently, while allowing learners the autonomy that SDT posits is essential for motivation.

5. ANALYTICAL METHODS IN LEARNER BEHAVIOUR RESEARCH

5.1 K-Means Clustering for Learner Segmentation

The application of cluster analysis to learner data is an emerging area of research in educational data mining. For example, (Borrás-Gené et al., 2019) used K-Means clustering to differentiate between MOOC participants who had an active profile and who were responsive to gamification, versus those who were passive and who would drop out. Also, (Lust et al., 2013) described tool-use clusters in blended learning and revealed that participants who were in the high tool-use clusters had improved academic results when compared to those in low tool-use clusters.

A particular advantage of K-Means clustering is that because it is an unsupervised method, it is useful for behavioural data, as it does not require the imposition of class labels. K-Means is one of a small number of clustering methods that offers a sliding scale of interpretability. The ideal number of clusters is based on the elbow method for between cluster variance, the silhouette for within cluster variance, and an interpretability of results measure.

PCA, as an accompaniment of K-Means, is widely used to assess the separability of clusters when the dimension of data is reduced, and to help visualize the effectiveness of the algorithm in differentiating the learner groups in the data set. Along with K-Means, PCA is one of the most vital tools of unsupervised learning in the literature of educational learner segmentation.

5.2 Spearman Rank-Order Correlation for Outcome Prediction

When using Likert-based survey items, order of preference is on an ordinal scale. Since Spearman's is appropriate if normality is not present, and is less sensitive to outliers, Spearman's is more appropriate than Pearson's for educational research survey data, which often is negatively skewed. In educational research based on Spearman correlations, positive learning outcome predictors are participation frequency, self-testing, and time invested ((Richardson, 2004); (Zimmerman, 2002)).

Analytical Method	Purpose in this Study	Precedent in Literature
K-Means Clustering (k to be determined by silhouette analysis)	Identify distinct learner behaviour segments	(Borrás-Gené et al., 2019)
Principal Component Analysis	Validate cluster separation; dimensionality reduction	Standard companion to K-Means
Spearman Rank Correlation	Identify significant predictors of learning outcomes	(Richardson, 2004); (Zimmerman, 2002)
Descriptive Statistics	Profile sample demographics and behaviour frequencies	Standard for survey-based research
Silhouette Score Analysis	Determine optimal number of clusters (k-selection)	Standard K-Means model selection

Table 1: Proposed Analytical Methods and Literature Precedents

6. RESEARCH GAPS AND PROPOSED RESEARCH DESIGN

6.1 Identified Gaps in Existing Literature

- Though numerous studies exist, there are still many areas of educational research that are lacking, which this study aims to address specifically:
- Massive Open Online Course engagement research has mainly focused on behavioural logging, which records and analyses learner actions, but not motivations or perceptions. Survey data will provide the missing dimensions that logging data has.
- Research on clustering learners in MOOCs has almost exclusively focused on the Western English-speaking population. The Indian urban mobile, multilingual, and busy learner is studying all the competing realities of work and study and is an entirely new population.
- Typically, research that focuses upon course completion treats participants as a single unit. There are few segmented studies that empirically group participants based on self-reported behavior and measure differential outcome predications for each group.
- Research studies that focus on non-MOOC online courses and analyze traditional surveys have not explored how different types of participation behavior - not demographics - relate to an individual's expected learning outcomes, and, as a result, have not utilized Spearman correlation analyses.
- None of the studies we examined utilized K-Means learner segmentation and Spearman correlation outcome prediction in the way we propose, simultaneously and on the same primary survey dataset.

6.2 Integrated Conceptual Framework

Based on the literature we reviewed, we present an integrated conceptual framework (see Figure 1) where Course Completion and Learning Outcomes are the result of an interaction between three determinant categories: Learner Factors, Content Design Decisions, and Structural Barriers. Learner Factors include self-determination theory, self-regulation, the depth of engagement of all three dimensions proposed by Fredericks, and within-group behavioral diversity based on the Kizilcec typology. Content Design Decisions include video design (length and format), the design of interactivity and assessments, and the design of spaced practice. Structural Barriers include time and scheduling conflicts, social isolation, platform design, and other barriers that restrict motivated participants from completing a course..

6.3 Proposed Research Design

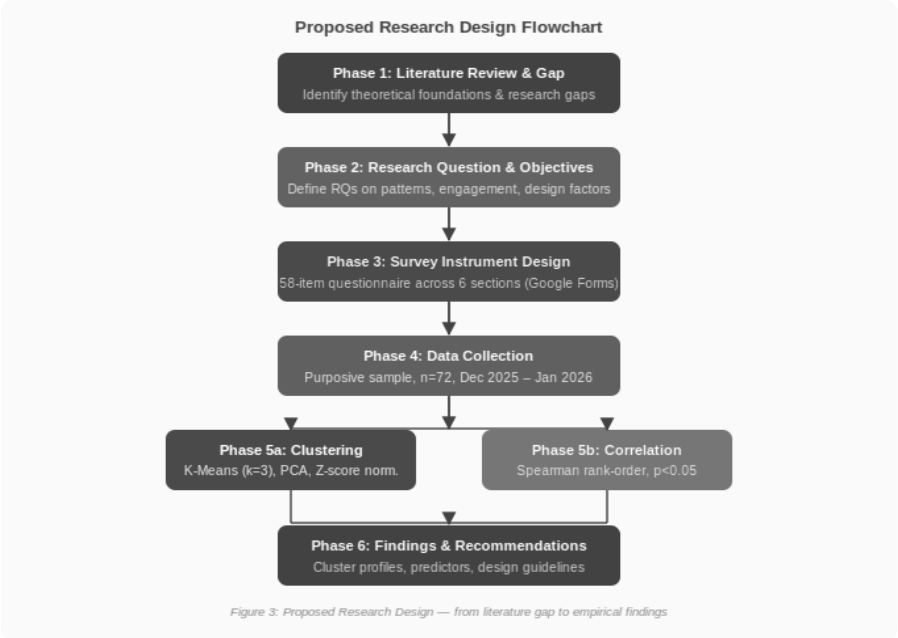

Figure 4: Proposed Research Design Flowchart - from literature gap to empirical investigation

The proposed study will use a cross-sectional, quantitative survey designed to capture six areas of interest. These include: (1) demographics, (2) history of online learning and preferred learning platforms, (3) habits focused on content viewing measured by a 5-point frequency scale, (4) learning style measured by a 5-point frequency scale, (5) active participation measured by a 4-point agreement scale, and (6) satisfaction of learning outcomes measured by a 4-point agreement scale and an overall satisfaction scale.

The sample will consist of online learners in urban settings in India who have either participated in online courses or are currently participating in online courses. Selection will be based on purposive, non-probability sampling and conducted through digital methods. For the exploratory purposes of the study, a minimum sample size of approximately 60–80 respondents is anticipated, based on the requirements of K-Means clustering and Spearman correlation analysis across the 28-item behavioural feature space. The analysis will be conducted in three parts: (i) a descriptive analysis of all variables, (ii) K-means clustering (the number of clusters to be determined by silhouette analysis) of the 28 behavioral features, and (iii) analysis of Spearman correlations on the behavioural features and outcome score.

Design Element	Specification	Justification
Research approach	Quantitative, cross-sectional survey	Enables statistical analysis across 58 variables
Sampling strategy	Purposive non-probability, urban India	Targets relevant, under-researched population
Target sample size	$n \geq 60$; target ~75–80	Adequate for K-Means (28 features) + Spearman
Data collection period	Planned: Q4 2025 – Q1 2026	Avoids academic semester extremes
Survey instrument	58 items across 6 sections	Covers all framework constructs
Clustering method	K-Means, k optimised by silhouette	Unsupervised; interpretable segments
Correlation method	Spearman rank-order ($p < 0.05$)	Appropriate for ordinal Likert data
Outcome variable	4-point self-rated learning outcome	Captures perceived learning quality

Table 2: Proposed Research Design Specifications

7. EXPECTED CONTRIBUTIONS AND CONCLUSION

7.1 Expected Theoretical Contributions

Three types of theoretical contributions are expected from the empirical study based on this review. This study will first assess the applicability of the (Kizilcec et al., 2013) typology within the context of a self-report survey. This involves testing whether the four behavioural archetypes described in MOOC log data have parallel representations in learner articulated engagement log data. Second, using Spearman correlations on a broad array of participation behaviours will provide new empirical insight regarding which SDT-aligned and metacognitive behaviours have the strongest correlations with perceived learning in the Indian urban learner context. Third, integrating K-Means segmentation with correlation-based outcome prediction will enable content design recommendations to be tailored for each identified learner segment, rather than relying on aggregate findings that may obscure important between-group differences.

7.2 Expected Practical Contributions

This study seeks three evidence-based design imperatives. Micro-learning architecture - contained in modular chunks of 10-15 minutes - is identified most often to structure design for the learning constraints of time faced by sample members. Formative assessments integrated into content modules - quizzes and prompts for reflective practice - are proposed to be the most beneficial singular intervention for the greatest enhancement in learning outcomes for sample members, in line with the practice testing effect literature. Finally, cluster differentiated design proposals are cited in the sample for the most engaged, moderately engaged, and least engaged learner groups, to offer personalization support based on behavioral data of the sample.

7.3 Conclusion

The literature on dropout theory, motivational psychology, the dimensions of engagement, content design, and the analysis and measurement of data aligns to build the foundations for primary field research focused on the study of the behavior of online learners. The reviewed literature supports an unambiguous and coherent design theory: the online course completion phenomenon does not stem from lack of discipline and/or poor self-regulation of learners but from course design. The courses most likely to facilitate the learning outcomes of sample members will be the courses that most effectively design learning activities that are within the attentional limits of learners, activate intrinsic motivation (through a design framework of self-determination theory), are interactive and embedded formative assessments, and that most effectively support learners in the regulation of their own cognitive and metacognitive processes.

The gaps identified in Section 6 establish that the most valuable next step is a planned primary survey study applying K-Means learner segmentation and Spearman outcome prediction to an Indian urban learner sample. That study will provide the empirical evidence needed to move from theoretical prescription to contextually grounded design recommendations. The conceptual framework and proposed research design in this paper constitute the complete specification for that investigation.

References

1. Borrás-Gené, O., Martínez-Núñez, M., & Martín-Fernández, L. (2019). Enhancing Fun through Gamification to Improve Engagement in MOOC. Informatics, 6(3), 28. https://doi.org/10.3390/informatics6030028
2. Boston, W., Díaz, S. R., Gibson, A. M., Ice, P., Richardson, J., & Swan, K. (2019). AN EXPLORATION OF THE RELATIONSHIP BETWEEN INDICATORS OF THE COMMUNITY OF INQUIRY FRAMEWORK AND RETENTION IN ONLINE PROGRAMS. Online Learning, 13(3). https://doi.org/10.24059/olj.v13i3.1657
3. Deci, E. L., & Ryan, R. M. (1985). Intrinsic Motivation and Self-Determination in Human Behavior. Springer US. https://doi.org/10.1007/978-1-4899-2271-7
4. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School Engagement: Potential of the Concept, State of the Evidence. Review of Educational Research, 74(1), 59–109. https://doi.org/10.3102/00346543074001059
5. Ghazali, S., Abdalla, H., Kamil, M. Z., Kakosimos, K., & Hodges, A. (2020). Development of an Educational Mixed Reality Game on Water Desalination Plants. 2020 IEEE Frontiers in Education Conference (FIE), 1–4. https://doi.org/10.1109/FIE44824.2020.9274022
6. Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of MOOC videos. Proceedings of the First ACM Conference on Learning @ Scale Conference, 41–50. https://doi.org/10.1145/2556325.2566239
7. Kizilcec, R. F., Piech, C., & Schneider, E. (2013). Deconstructing disengagement: Analyzing learner subpopulations in massive open online courses. Proceedings of the Third International Conference on Learning Analytics and Knowledge, 170–179. https://doi.org/10.1145/2460296.2460330
8. Lust, G., Elen, J., & Clarebout, G. (2013). Students' tool-use within a web enhanced course: Explanatory mechanisms of students' tool-use pattern. Computers in Human Behavior, 29(5), 2013–2021. https://doi.org/10.1016/j.chb.2013.03.014
9. Mayer, R. E., & Moreno, R. (2003). Nine Ways to Reduce Cognitive Load in Multimedia Learning. Educational Psychologist, 38(1), 43–52. https://doi.org/10.1207/S15326985EP3801_6
10. Paivio, A. (1990). Mental Representations. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195066661.001.0001
11. Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, 82(1), 33–40. https://doi.org/10.1037/0022-0663.82.1.33
12. Richardson, J. T. E. (2004). Methodological Issues in Questionnaire-Based Research on Student Learning in Higher Education. Educational Psychology Review, 16(4), 347–358. https://doi.org/10.1007/s10648-004-0004-z
13. Roediger, H. L., & Karpicke, J. D. (2006). Test-Enhanced Learning: Taking Memory Tests Improves Long-Term Retention. Psychological Science, 17(3), 249–255. https://doi.org/10.1111/j.1467-9280.2006.01693.x
14. Rovai, A. P. (2003). In search of higher persistence rates in distance education online programs. The Internet and Higher Education, 6(1), 1–16. https://doi.org/10.1016/S1096-7516(02)00158-6
15. Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68
16. Sweller, J. (1988). Cognitive Load During Problem Solving: Effects on Learning. Cognitive Science, 12(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4
17. Tinto, V. (1975). Dropout from Higher Education: A Theoretical Synthesis of Recent Research. Review of Educational Research, 45(1), 89–125. https://doi.org/10.3102/00346543045001089
18. Zimmerman, B. J. (2002). Becoming a Self-Regulated Learner: An Overview. Theory Into Practice, 41(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2