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A structural model for China's massive open online courses from outcome-based education perspective

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Abstract

To achieve the effectiveness of high-quality online education, colleges and universities have developed massive open online courses in their curriculum. Guided by outcome-based education (OBE), this paper analysed online open courses from China's undergraduate universities, then a structural model of course resource elements was constructed by using interpretive structural model. Through the modeling, the results of this study showed the hierarchical relationships, layered structures, and mutual influences among the elements of courses, which stress the importance of connection of human and material resources based on outcome perspective that fulfilling the gap of previous researches.

Keywords: massive open online courses, OBE, interpretive structural modeling

INTRODUCTION

Sine 2008 massive open online courses (MOOCs) was introduced, it has transformed education globally. The development of MOOCs in China has attracted a diversity of learners and offered them a wide range of courses. There is a need to consider MOOCs as a natural part of universities' course offerings and business models and to recognize MOOCs as valuable for learners (Ossiannilsson et al., 2016). The flexibility of MOOCs enables participants to engage in learning activities without restriction of time and place (Wei et al., 2023). Number of learning materials and activities such as video lectures, discussion forums, and peer reviews are carefully designed for learners to complete the online courses.

Previous studies on MOOCs have determined that several important factors in terms of learning motivation, new patterns of learning, and self-regulated learning strategies (Li & Shi, 2020; Song et al., 2022; Wei et al., 2023; Zhu & Hu, 2021). Recently, universities in China have encouraged their teachers to design MOOCs as students can recap the course content after the class in their own convenience by taking the advantage of MOOCs. However, the problem is that the design and delivery of MOOCs can be inappropriate and ineffective, especially for educational teams with less teaching experiences of MOOCs. Research pointed out multiple barriers that can reduce the learning outcomes, as well as demotivating the students (Huang et al., 2024). For example, students can easily drop off the learning due to the poor self-regulation. Also, the teaching pattern of MOOCs can be new to most of the course designers.

Since MOOCs was introduced, it was recognized as valuable components of universities' course offerings to enhance lifelong learning and continuous improvement of educational practices. There have been many researches focusing on the benefits of the factors influencing success of MOOCs in high education, as well as the barriers and perceived learning outcomes (Albelbisi et al., 2018; Huang et al., 2024; Ossiannilsson et al., 2016; Wei et al., 2023).

However, there has been little researches about how to design MOOCs, therefore this paper aims to explore the following gap:

What are the important elements for effective open online courses and what are the relations among them (how can these elements influence the learning outcome of MOOCs)?

By using the interpretive structural modeling (ISM), the paper will reveal a structural model to answer the above question.

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Contribution to the literature

- This paper generated resource elements of MOOCs.
- This paper analysed the relationship of these important resource elements by using interpretative structure model from outcomes based education perspective.
- This paper finally conducted a structural model to explain the relations among course' elements.

LITERATURE REVIEW

This study aims to gain valuable insights into how MOOCs can support outcome-based education (OBE) goals by enhancing learning effectiveness and achieving desired educational outcomes.

So the literature review examines the contribution of MOOCs, as well as the critical issues, challenges and barriers.

Ossiannilsson et al. (2016) conducted a qualitative literature review analyzing the role of MOOCs in lifelong learning, professional competence development, validation of learning, and degree recognition. MOOCs should be strategically integrated into universities' curriculum offerings.

Bai et al. (2017) selected resource elements from nine typical courses and constructed an online open course resource structural model based on the OBE concept using the ISM approach. This model clarified the component elements and hierarchical relationships of online open course resources and provided a visual representation.

Albelbisi et al. (2018) compiled and analysed 12 main factors related to successful MOOCs implementation, including learner characteristics, pedagogy, instructional design, assessment, and MOOCs quality were identified from researches that has been published between 2012 and 2016. The study pointed out instructor's participation in discussion forum activities can actively support learners and positively influence learning outcomes.

Wei et al. (2023) examined how motivation, perceived learning support, learning engagement, and self-regulated learning strategies relate to learners' perceived learning outcomes in MOOCs. Learners with autonomous motivation demonstrated higher scores on perceived learning outcomes than those with controlled motivation. Course design, interaction with instructors and peers, engagement in learning activities, and applying cognitive and metacognitive learning strategies significantly explained differences in perceived learning outcomes. Self-regulated learning strategies mediated the relationships between motivation, perceived learning support, learning engagement, and perceived learning outcomes. To enhance perceived learning outcomes in MOOCs, it is critical to offer autonomy support, and embed self-regulated learning interventions into curriculum design and learning content.

Li and Shi (2020) analysed challenges in China's online vocational education (e.g., insufficient digital competencies of instructors, rigid pedagogical designs, inadequate resources, learner management difficulties, and platform quality gaps) by comparing with Dutch practices. The Dutch online teaching in vocational education changes the traditional teaching mode which is mainly selective and informed, and implements new ideas and new models such as "mixed learning" situation and "self-oriented" learning situation, and has achieved remarkable results. Therefore, learning from Dutch experience, online vocational education in China needs to innovate the online teaching design mode, strengthen the guidance of online teaching norms, enhance learners' self-oriented ability, enhance the information literacy of all kinds of subjects, and optimize the online teaching conditions of vocational education.

With aims to improve the design and delivery of supply chain management MOOCs to enhance student learning outcomes, Huang et al. (2024) identified 16 barriers to MOOCs from the online reviews and then ranked them based on their severity of reducing learning outcomes. Barriers such as the MOOCs content is not tightly linked to the supply chain practices, the MOOCs content is out of date, the MOOCs are not attractive and the MOOCs learning resources are not enough to fulfill the learning needs are ranked the most significant negative impacts on MOOCs learning outcomes, therefore actions should be taken to mitigate them in the design. One of the novelties of this study is that they compared the different perceptions of barriers between students and lecturers.

Chinese Practices of Researches

In recent years, universities in China have encouraged their faculties to develop MOOCs for relevant courses from OBE perspective. Educators from colleges in Guangdong, Chongqing, Shandong, Tianjin, Guangxi, Jiangsu, Wuhan, Harbin, Hubei, and other regions have actively involved in curriculum design of MOOCs (Cao, 2020; Gu et al., 2008; Huang, 2021; Lan et al., 2021; Liu, 2019, 2020, 2022; Liu & Peng, 2018). These studies uniformly adopt a case-based approach, either through individual courses or specialized programs, employing backward design methodologies. The process begins with defining clear talent cultivation objectives, followed by systematically organizing curriculum content and credit hours, and ultimately

implementing classified guidance to optimize the entire curriculum system.

Liu (2019) reformed the "introduction to E-commerce" course by reversing traditional teaching models to prioritize learning outcomes, thereby enhancing students' practical abilities. Similarly, Cao (2020) applied OBE to construct a training system for "dual-qualified" teachers in vocational marketing education, focusing on aligning training objectives with occupational standards. Liu (2022) and Huang (2021) further extended OBE to financial management and tourism courses, respectively, emphasizing project-based learning and ideological integration to foster comprehensive skills.

Despite its benefits, challenges persist. Resistance to traditional pedagogical shifts, resource limitations, and varying levels of student autonomy are common barriers. Proposed solutions include robust teacher training programs, the development of user-friendly platforms, and the establishment of multidimensional evaluation systems to ensure continuous improvement.

Academic Review of Researches

From the perspective of OBE, this paper analyzes the factors influencing learning outcomes and effectiveness in MOOC design, as well as the obstacles that need attention (Albelbisi et al., 2018; Huang et al., 2024; Wei et al., 2023). The key factors include motivation, perceived learning support, learning engagement, and self-regulated learning strategies. Autonomous motivation significantly enhances learning outcomes by driving learners to engage deeply in courses. Perceived learning support, encompassing course design, instructor-learner interaction and learner autonomy play a crucial role in improving learning outcomes. Learning engagement, particularly depth of involvement, positively affects outcomes, while superficial assessment participation does not. Self-regulated learning strategies, including cognitive, meta cognitive, and resource management strategies, mediate the relationship between motivation, support, engagement, and outcomes.

However, several obstacles exist in MOOC design that hinder learning outcomes. These include a disconnect between course content and practical applications, outdated course content that fails to cover the latest knowledge and technologies, insufficient course attractiveness due to dull content and monotonous teaching methods, inadequate learning resources such as a lack of reference books and practice exercises, and poor course discussion management leading to an inactive discussion atmosphere (Li & Shi, 2020).

To overcome these obstacles and enhance learning outcomes, MOOCs design should adhere to OBE principles. This includes clearly defining learning outcomes at the outset, strengthening motivation through interesting and challenging tasks, optimizing perceived learning support with well-structured courses and active interactions, promoting deep learning engagement via diverse activities, cultivating self-regulated learning abilities, continuously updating course content, enhancing course attractiveness with varied teaching methods, providing comprehensive learning resources, and strengthening course discussion management to foster a vibrant learning community (Huang et al., 2024; Song et al., 2022).

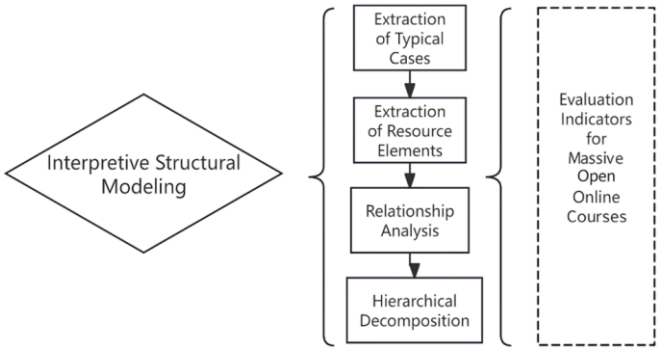

Figure 1. The construction process and method of the structural model (Source: Authors' own elaboration)

METHODOLOGY

Methodology and Procedures

This study utilizes ISM, case studies, and content analysis to construct a structural model of online open courses. The modeling process is generally divided into four stages: selection of representative cases, element extraction, relationship analysis, and matrix computation, followed by hierarchical decomposition. The ISM method permeates the entire model construction process, which is divided into four steps (see **Figure 1**).

During the element extraction phase, we extracted the constituent elements of online open courses. This phase primarily utilized case study and content analysis methods: the case study approach was employed to track typical online open courses, while content analysis was used to systematically quantify and analyze the course resource elements extracted from these representative cases. During the relationship analysis phase, guided by the OBE paradigm, we examined the relationships among the identified elements of online open courses. In the matrix computation and hierarchical decomposition phase, we transformed the element relationships into matrix format, performing Boolean operations, regional decomposition, and inter-level decomposition to ultimately derive the hierarchical structure of online open courses.

Table 1. Extraction of the typical online open courses

Online open courses	Learning platform	University
Fundamentals of programming (using C language)	www.icve.com.cn	Chongqing Polytechnic University of Electronic Technology
"Internet + supply chain management"	www.zhihuishu.com	Chongqing Vocational and Technical University of Mechatronics
Mechatronics technology	www.icve.com.cn	Nanjing Vocational University of Industry Technology

Table 2. Extraction of the typical online open courses resource elements

Resource category	Elements	Specific resources	Elements no
Material resources	Basic elements	-Talent cultivation program -Course standards -Nature of the course -Course articulation	S1(4)
	Self-learning resources	-Learning videos -Courseware -Mind maps -Other documents	S2(4)
	Activity resources	-Topic discussions -Discussion forums -Themed conferences -Sharing of insights	S3(4)
	Evaluation resources	-Test -Assignment -Examination	S4(3)
	Learning outcomes	-Certificates -Technical skills -Course project	S5(3)
Human resources	Course instructors	-Course director -Course instructor -Teaching assistant	S6(3)
	Course supporters	-Business professionals -Technical expert -Industry expert	S7(3)
	Learners	-Students -Anybody who wants to learn the course	S8(2)

Construction Process

Extraction of typical cases

Under the guidance of the OBE concept, this study selects three online open courses (**Table 1**) from Chongqing Polytechnic University of Electronic Technology, Chongqing Vocational and Technical University of Mechatronics, and Nanjing Vocational University of Industry Technology for typical case analysis, which of these three universities are the top vocational universities in China Mainland.

Extraction of resource elements

The analysis reveals that online courses in vocational education encompass both material and human resources. Material resources are further divided into five elements: basic information, self-learning resources, activity resources, evaluation resources, and learning outcomes. Human resources include three elements: course instructors, course supporters, and learners. The details are presented in **Table 2**.

Relationship analysis

According to the OBE concept, teaching supporters should design course resources from the learners' perspective. Based on this concept, the study compares each element (Si) with every other element. If there is a direct causal relationship, it is represented by the symbol "1"; if there is no direct causal relationship, it is represented by "0". This forms an adjacency matrix representing the relationships among the elements of online open courses.

As shown in **Table 3**, basic information, self-study resources, and activity resources have an impact on learning outcomes; evaluation resources are used to assess learning outcomes; course supporters, course instructors, and learners jointly organize, develop, and interact with basic information, self-study resources, and activity resources. At the same time, course instructors

Table 3. Adjacency matrix

	S1	S2	S3	S4	S5	S6	S7	S8
S1	0	0	0	0	1	0	0	0
S2	0	0	0	0	1	0	0	0
S3	0	0	0	0	1	0	0	0
S4	0	0	0	0	1	0	0	0
S5	0	0	0	0	0	0	0	0
S6	1	1	1	1	0	0	0	1
S7	1	1	1	1	0	0	0	1
S8	1	1	1	1	1	0	0	0

Table 4. Accessibility matrix

	S1	S2	S3	S4	S5	S6	S7	S8
S1	1	0	0	0	1	0	0	0
S2	0	1	0	0	1	0	0	0
S3	0	0	1	0	1	0	0	0
S4	0	0	0	1	1	0	0	0
S5	0	0	0	0	1	0	0	0
S6	1	1	1	1	1	1	0	1
S7	1	1	1	1	1	0	1	1
S8	1	1	1	1	1	0	0	1

and supporters construct evaluation resources; learners are not only creators of learning outcomes but also generators of self-study resources and activity resources.

Hierarchical decomposition

By using SPSSPRO, the accessibility matrix (see **Table 4**) was obtained. Subsequently, the accessibility matrix was subjected to regional decomposition and inter-level decomposition to derive the hierarchical decomposition among the elements of online open course resources (see **Table 5**).

Hierarchical relationship

1. Through decomposition, the following hierarchical relationships can be derived:
2. Learning outcomes are the primary focus of online course resource elements.

Table 5. Hierarchical decomposition

Hierarchies	Elements
1st hierarchy	Learning outcomes
2nd hierarchy	Basic elements, self-learning resources, activity resources, & evaluation resources
3rd hierarchy	Learners
4h hierarchy	Course instructors & course supporters

3. Learning outcomes require the support of course resources, which in turn influence learners.
4. Learners are at the center of the entire hierarchical relationship.
5. Course supporters and instructors are at the lower levels of the hierarchy, serving as the foundation for the entire structure.

Based on the above analysis, a structural model can be presented as shown in **Figure 2**.

APPICATION OF ONLINE OPEN COURSE STRUCTURAL MODEL

To validate the adaptability and effectiveness of the online open course structural model based on the OBE concept, this study utilized the model to design the online open course modern marketing. As a core course for the e-commerce major, modern marketing is designed to cultivate students' practical competence in marketing. Through the course, students are required to master analytical tools such as SWOT, STP, and BCG matrix, as well as apply these models to problem-oriented business case study and ultimately formulate marketing strategies.

The inspiration of OBE concept for constructing online open courses lies in its clear focus on learners' ultimate achievements rather than grades. By adopting backward design centered on anticipated outcomes, OBE creates opportunities and provides support to enhance student success. Consequently, the modern marketing online course under the structure model–

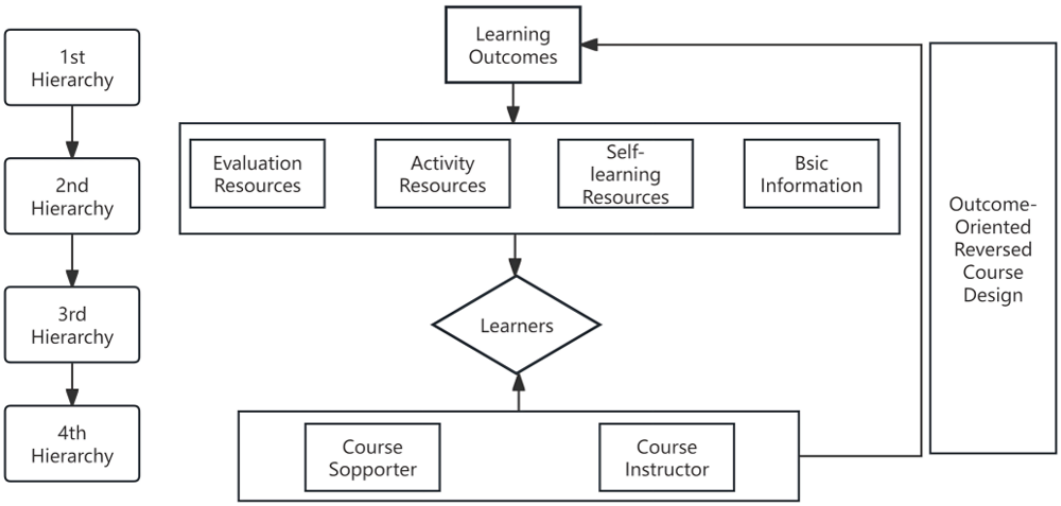

Figure 2. A structural model for China's MOOCs (Source: Authors' own elaboration)

Table 6. Learning outcomes (LO)

Primary outcomes	Secondary outcomes	LO
Cultivate practical marketing competencies	Identify challenges and issues	LO1
	Conduct in-depth analysis to propose 1-2 viable solutions	LO2
Learn to apply marketing analysis models	Demonstrate proficiency in applying analytical tools	LO3
	Develop value-driven marketing strategies	LO4
Enhance marketing planning through AI tools	Utilize AI tools in marketing research	LO5
	Create innovative marketing plans	LO6

whether in instructional design or implementation–remains firmly the learning outcomes oriented.

Level 1. Defining Learning Outcomes

The learning outcomes have shifted from a broad aim of cultivating "innovative marketing technical talents" to a skill-oriented objective: Equipping students to identify, analyze, and solve problems in complex market environments; to be able to develop marketing plans; to collect and organize data using digital tools and master key analytical frameworks including the five-step marketing model, Boston consultant group matrix, strength-weakness-opportunity-threat analysis and micro/macro environmental analysis (see **Table 6**).

Level 2. Learning Resources

Learning resources are categorized into four types based on the model's design: foundational information, activity components, self-directed learning elements, and assessment components.

Basic elements

Basic elements includes an overview, syllabus, and schedule. This section outlines the knowledge students will acquire, the competencies they will develop, the practical assignments or exercises they must complete, and the estimated time commitment.

Activity resources

Activity resources primarily consist of case studies and outcome-orientated assessments, as well as online discussions or thematic forum. Case studies based on real marketing operation were offered as the core resources for students to learn marketing models. The introduction of latest industrial standards and policies were also into the case studies.

Self-learning resources

Self-learning resources include pre-recorded videos that cover theoretical concepts and case study introduction, as well as written materials, and supplementary resources. These videos were reviewed each year in order to give students the latest knowledge and practices.

Evaluation resources

Evaluation resources include instructor feedback on assignments, online discussions of activity proposals, and peer evaluations among participants.

Level 3. Learners

The initial teaching practice was implemented in two classes (class X: 54 students; class Y: 63 students). Class X adopted MOOC-integrated teaching with conventional instruction, while class Y only utilized conventional instruction. Research revealed that as online learning progressed and course complexity increased, the following issues became prominent:

Decline in learning engagement

Initially, students exhibited high enthusiasm due to the novelty of the learning format. However, engagement dropped significantly as the course advanced, with only 24%-27% of students completing all online course videos.

Diversion of learning attention

When students encountered challenging modules during mobile device-based self-learning, they often avoided complex content and shifted focus to less demanding activities.

Need for integrated online/off-line learning outcomes

Certain pedagogical advantages achievable in offline settings–such as hands-on equipment operation and practical training exercises–proved difficult to replicate online

Due to the asynchronous nature of MOOCs. A comparative analysis of the two classes demonstrated that combining MOOCs with offline learning activities yielded superior outcomes.

Level 4. Courses Designers

If learners represent the core of a course and learning outcomes signify its achievements, then course designers are its soul. After thoroughly understanding students' perspectives and expected outcomes regarding modern marketing education, course designers establish learning objectives by integrating societal contexts, employment trends, and external demands from stakeholders such as parents, institutions, enterprises,

and industry development. Consequently, the three designers of this course are dual-qualified educators with robust professional expertise and extensive practical experience, possessing both digital literacy and competence in leveraging emerging artificial intelligence-driven pedagogical tools.

Upon completion of the course, this study conducted an evaluation among students from two classes. Each class was divided into 8 groups, with 4-5 students in each group, who presented PowerPoint analysis and critiques of their learning outcomes. The subsequent sections offer summarized critiques from each group (**Table 7**).

DISCUSSION

The Importance of Learning Outcomes

Outcomes serve as the starting point for designing the online course, and they need to be specific rather than abstract concepts such as attitudes, values, emotions, or perceptions. Learning outcomes need to be achieved through curriculum and instruction, which have a clear mapping relationship with the curriculum structure. Each learning outcome should be supported by a specific activity. OBE encourages critical thinking, communication, reasoning, evaluation, feedback, and action. It also sets learning objectives for each stage, allowing students to gradually achieve success, progressing from basic to advanced levels. The evaluation emphasizes the connotation of achieving learning outcomes and individual learning progress, rather than comparisons among students. The "outcomes" under the OBE concept should possess the following characteristics:

1. Outcomes should be what students truly need for their long-term development, not just short-term performances.
2. Outcomes require students to repeatedly cycle through "knowing," "being like," and "doing" before they can ascend from knowledge to cognition and then to ability.
3. Outcomes should take into account life skills and be applied in teaching practice so that they can be utilized after leaving school.
4. The design of outcomes should follow the principle of backward design, with evaluations conducted at each stage for the learning outcomes of that stage.
5. Outcomes should be defined using observable action verbs such as describe, explain, design, etc.

The Importance of Four Resources

From the application of the structural model, this study clearly outlined the different learning outcomes between two classes. Class X with integration of MOOC has clear outstanding outcome performance than the class without.

Class X were benefited from adequate learning resources from MOOCs, such as reading materials, pre-recorded videos and exercise. Also, multi-media tools, including animations, dynamic graphs, or even virtual reality, can be introduced in the course to make the content more attractive and easier to understand. Virtual teamwork can be applied, as students within a team can motivate each other, which can enhance their learning experience when studying time was too long and studying content was too difficult.

Moreover, the attractiveness of the MOOCs lay in the teaching pattern. MOOCs morden marketing provides pre-recorded videos for learners, however, learners did not find them attractive as the course instructor expected. On the other hand, case studies and topic based in-class discussion can better stimulate students' interests and motivate them. So here we strongly suggest the traditional learning-by-listening approach is not an appropriate way for MOOCs to deliver learning outcomes. The activities resources should be integrated to the MOOCs design.

Though several studies have outlined the importance of activity resources in MOOCs design, questions of "how to do and what to do" were still unsolved and to be answered. From this study, the performance of classs X suggested outcome-oriented phased learning summaries are essential learning activities. On one hand, they help learners cultivate a sense of academic achievement; on the other hand, they enable learners to maintain alignment with established learning plans and sustain continuous progress, rather than experiencing interruptions or becoming disoriented in the digital environment. While these summaries can take the form of online thematic discussions, synchronous offline and online implementation is recommended when feasible.

Upon completion of learning activities, the assessment phase of activity outcomes holds equal importance, yet it is frequently overlooked in online courses. Research indicates that fuzzy and ambiguous criteria of learning performance evaluation will harm the learning outcomes of students. Indeed, this study found through comparative teaching practices that announcing clear and explicit evaluation criteria prior to learning activities significantly enhances students' performance. For instance, in the Wanglaoji case study, each step of the five-step model provided students with precise guidance and a tangible reference for evaluating learning outcomes.

So here we argue that the evaluation criteria should be stated clearly in each teaching unit of MOOCs instead of only presenting it at the beginning or the end of the course.

Moreover, the corresponding feedback should be given immediately after the completion of each activity

Table 7. Learning outcome (LO) evaluation

Class		Summary	LO
Class X	Focus group A	Marketing extends far beyond mere buying/selling or in-store promotions–it is a societal and managerial process through organization and value creation. What resonated most deeply was the five-step marketing model, as subsequent course content consistently referenced and expanded upon this framework. The case study of "Wanglaoji" (a Chinese herbal tea brand) left an indelible impression, particularly since it reappeared in examination questions, further solidifying its significance in our memory. Use AI tool in PPT	LO1, LO2, LO3, & LO4
	Focus group B	To be a capable marketers, must deeply understanding customers' needs and consistently ready for challenges. Utilized the five-step model, SWOT model, purchase behavior model, and Maslow's hierarchy of needs in the "Wanglaoji" case study. Used AI tool in PPT	LO1, LO2, LO3, & LO4
	Focus group C	Marketing enables us to understand market dynamics and customer insights, thereby empowering us to better understand customers' needs and how to deliver products/services. The five-step marketing model serves as the central framework underpinning all marketing strategies. Through studying the course, we have gained profound insights of why and how "OPPO and Vivo" had succeed. Used AI and mind map in PPT	LO1, LO2, LO3, & LO4
	Focus group D	Marketing has fundamentally transformed the way we observe and perceive the world: to adopt multi-dimensional analytical framework; to recognize interconnected systemic relationships in market dynamics; to incorporate human-concentric considerations into strategic formulations; to maintain forward-looking vision while addressing immediate needs. To apply these models in five case studies To utilize mind map tool	LO1, LO2, LO3, LO4, & LO5
Class Y	Focus group E	Utilized the five-step model, SWOT model, 4PModel and macro/micro environment analysis in the theory, but not in the case study	LO1 & LO3
	Focus group F	To analyse the case study of Haier group without using any analytical tools	LO2 & LO3
	Focus group G	This learning journey has revealed that markets permeate every aspect of our life. Those once-vague concepts that seemed ethereal and abstract have gradually crystallized into tangible insights! To utilize the 4PModel in the case study, but not into a marketing plan	LO1, LO2, LO3, & LO4
	Focus group H	To utilize the five-step model in the case study of Wanglaoji, but not into a marketing plan	LO2 & LO3

so that students can know whether or not they have achieved learning outcomes, If the outcomes were not yet achieved, how far behind they were and what actions should be taken further should be given. By doing so, the students can obtain a higher sense of achievements and the course instructors can adjust the future course plan accordingly.

The majority of learners in this study were university students who were required to invest time in MOOC to complete the requirements of their academic programs. So the research showed that students with abilities to use cognitive and meta-cognitive learning strategies were more likely to stimulate themselves to involve in MOOC learning and perceive a higher level of learning outcomes. This finding was in agreement with Wei et al. (2023).

In light of learners who primarily engage with MOOCs through extrinsic motivation, this study proposes that curriculum designers and instructors should prioritize supportive pedagogical strategies. Such approaches aim to foster autonomous motivation and sustained engagement among participants, aligning with the tenets of self-determination theory (SDT). As SDT posits, contextual support that addresses learners' fundamental psychological needs-namely competence, relatedness and autonomy- facilitates the internalization of learning behaviors. By systematically integrating these supports into MOOC design, educators can create environments that progressively transform externally driven learners into self-regulated participants, ultimately enhancing learning outcomes in alignment with OBE frameworks.

To enhance perceived competence, the content of learning materials differing in difficulty and complexity should be considered, which could support learners to gradually challenge themselves to obtain sophisticated

knowledge and skills. One suggestion for learners to feel like being autonomy supported for curriculum designers and instructors is to pay attention to optimize courses' coherence and structure. Moreover, technical online AI tutorial support could be offered to promote more learner-orientated pedagogical teaching.

Current methodologies for assessing learning outcomes remain limited in their theoretical depth, frequently relying on reductionist single-variable metrics that fail to capture the complexity of educational phenomena. Moreover, the interrelationships among critical pedagogical constructs- including instructional design elements, learner engagement dynamics, and assessment mechanisms- remain insufficiently. This perspective posits that perpetuating fragmented analysis of individual educational components, without systematic examination of their synergistic interactions, constitutes a significant barrier to theoretical advancement. A systems-oriented approach in OBE is therefore advocated to elucidate how these multifaceted factors coalesce to influence learning trajectories and instructional efficacy.

CONCLUSION

This study constructs a resource structure model for open online courses based on the OBE concept, guided by demands for talent cultivation and the practical needs of MOOCs. By integrating methodologies such as interpretative structural modeling, typical case studies, and content analysis, the model integrates human and material resources in the course, emphasizing student-centered, progressive generation of curricular resources, demonstrating distinct innovations in conceptual and applied frameworks. Teaching resources and learning activities are guided by outcome-based principles, enabling students to synthesize and transfer knowledge in digital environments, thereby fostering higher-order thinking development.

Comparative teaching analyses reveal that students' online autonomous learning often remains passively motivated due to limitations in self-awareness and learning motivation. Course designers must therefore provide moderate scaffolding and appropriate time constraints to empower learners in autonomous learning, construct progression pathways, and stimulate iterative learning. The integration of big data analytic and AI teaching assistants in online courses enables precise analysis of learning processes, accurate prediction of outcomes, and dynamic adjustment of instructional strategies. These technologies address personalized learning needs by delivering challenges and support aligned with students' capabilities.

Traditional university classroom teaching faces numerous unresolved challenges, necessitating effective online pedagogical strategies to expand learning spaces and enable lifelong learning. Online education transcends temporal and spatial limitations, offering broader opportunities for talent cultivation. Only through diversified teaching models can a three-dimensional educational space be established, supporting lifelong learning and ensuring measurable learning outcomes. It is hoped that this structural model will be adopted and further refined in broader curricular design contexts.

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