# A Study on the Intention of Knowledge Interaction Behavior between Teachers and Students under Mixed Teaching Environment - Based on the Perspective of Value Co-Creation

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**Abstract**—In the internet era, a hybrid teaching model based on the perspective of co-creation has rapidly emerged in university teaching practices, and how to effectively promote the intention of knowledge interaction behavior between teachers and students in the hybrid teaching model has become a hot topic in teaching activities in universities today. This paper proposes a framework of "cognitive-emotional-conative" based on the theory of co-creative teaching value, and combines the UTAUT2 theoretical framework to construct a conceptual model that affects the intention of knowledge interaction behavior in the hybrid teaching model. Using qualitative comparative analysis (QCA) methods, this article conducts empirical exploration to explore the complex causal mechanisms of multiple factors affecting knowledge interaction behavior in the perspective of value co-creation. The study found that knowledge interaction behavior between teachers and students in the hybrid teaching model is influenced by multiple complex factors, and effort expectation, practical value, and social value are the three main driving paths that promote the intention of teachers and students to participate in knowledge interaction behavior in the hybrid teaching model.

**Keywords**-co-creation; blended learning model; behavioral intention; QCA method; UTAUT2

## 1    Introduction

With increasing attention from scholars in the field of education to the hybrid teaching mode, this mode has become an important vehicle for higher education reform. This model not only accelerates the transformation of students into learning subjects, but also effectively integrates teaching resources and improves teaching quality. Nevertheless, despite the significant advantages of hybrid teaching, its benefits have not been fully realized due to limitations imposed by the behavioral intention of knowledge interaction between teachers and students. Therefore, it is a pressing issue to explore the influencing factors of knowledge interaction behavior intention in hybrid teaching modes, to develop strategies that enhance participation in knowledge interaction behaviors, and to improve the effectiveness and value of teaching under this mode.

According to existing research, to address this issue, educators need to adopt a transformed teaching philosophy [1], paying attention to the differentiation and individualization of

students in teaching. They should adopt diversified blended teaching modes [2] stimulated by the characteristics of their own courses and students to stimulate students' independent learning and interactive communication [3]. In addition, schools should strengthen infrastructure construction, build online educational resource sharing platforms [4], create smart classrooms [5], and create integrated and borderless blended learning spaces, etc. [6]. Although these existing solutions have improved the infrastructure and teaching mechanisms, there is still room for improvement in the co-creation and realization of teaching value by teachers and students. Currently, research on the theory of teacher-student value co-creation in the blended teaching model is still relatively lagging behind.

Therefore, from the perspective of value co-creation, this paper aims to investigate the influencing factors of teachers' and students' behavioral intention of knowledge interaction in the mixed teaching mode, explore the driving paths of each factor, and analyze the role transformation of teachers and students as well as more effective teaching value co-creation in this context. Additionally, this paper will reveal the way and mechanism of value co-creation in the hybrid teaching mode, providing practical guidance and theoretical basis for promoting high-quality development in higher education.

## 2 theoretical foundation

### 2.1 Blended Learning Theory

Blended learning is a teaching method that combines the advantages of online and traditional face-to-face teaching. There are three types of blended approach: learning approach, learning space and teaching format. Blended learning mode refers to online and offline blended learning, blended learning space divides the teaching process into in-class and out-of-class, and blended teaching form integrates traditional classroom and online teaching form. This teaching method can improve the learning efficiency and teaching effect[7].

### 2.2 Knowledge Interaction Theory

Knowledge interaction is a complex process that revolves around knowledge as its core element, comprising three essential components: the object, means, and subject of knowledge interaction[8]. It enables the transfer of existing knowledge to novel contexts for decision-making, problem-solving, and even knowledge innovation. In the realm of education, knowledge interaction pertains to communication and interaction between teachers and students to facilitate knowledge transfer and comprehension. This encompasses diverse forms of interaction such as classroom discussions, Q&A sessions, group activities, experiments, and projects, aimed at stimulating students' interest in learning and improving learning outcomes. Moreover, knowledge interaction fosters cooperation and communication among teachers, collectively enhancing the quality of teaching and education.

### 2.3 Value Co-creation Theory

The theory of value co-creation was initially proposed by management experts Prahalad et al in the early 21st century. It is a novel approach to value creation that centers around the individual and involves both consumers and businesses. This concept has gradually been adopted in the field of education. From the perspective of value co-creation, the hybrid

teaching model emphasizes the repositioning of teacher and student roles with the goal of co-creating teaching value. Teachers and students act as knowledge producers and consumers at different stages, completing the connection between production and consumption to maximize the value of teaching [9]. Therefore, value co-creation in the education sector can be understood as the process of teachers and students collaborating, sharing, transferring, and realizing educational value.

## 2.4   UTAUT2 Theoretical Model

UTAUT2, which stands for Unified Theory of Acceptance and Use of Technology 2, is an extension and expansion of the UTAUT model, as shown in Figure 1. Also, this paper defines the seven factors of UTAUT2, which are shown in Table 1.This model comprehensively considers both technological and individual factors, broadens the scope of research objects, and has high explanatory power in the field of consumer behavior influence factors research[10]. Therefore, this study adopts the UTAUT2 model to better measure the factors influencing the behavioral intention of teachers and students towards blended learning from the perspective of information technology, both online and offline.
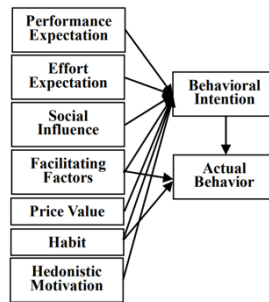


**Figure 1** UTAUT2 model

**Table 1** Definition of UTAUT2 model variables

| Core Variables | UTAUT2 definition |
|---|---|
| Performance Expectation(PE) | Job performance or benefits resulting from participation in the use of blended learning models |
| Effort Expectation(EE) | Time and effort consumed in using online teaching systems or tools |
| Social Influence(SI) | Degree of influence by surrounding groups using Internet technology for blended learning |
| Facilitating Factors (FC) | Extent of support for blended learning in terms of resources available |
| Price Value(PV) | Perceived monetary costs of using online teaching tools |
| Habit(HA) | The extent to which there is a tendency to use online teaching resources spontaneously |
| Hedonistic Motivation(HM) | Perceived pleasure or satisfaction in using Internet resources for blended learning |

# 3 Analysis of Blended Teaching Models from the Perspective of Value Co-Creation

This paper argues that the characteristics of the hybrid teaching model under the perspective of value co-creation theory can be elaborated from three aspects: teacher and student roles, value co-creation process, and value co-creation dimensions.

## 3.1 The Process of Transforming Teacher and Student Roles in a Blended Teaching Model

In traditional classrooms, teachers are usually the leaders and students are passive listeners. However, this teaching method not only limits the activity space but also hinders effective interaction and communication between teachers and students. Therefore, this study proposes a theoretical framework of "cognition-emotion-intention" and applies it to the blended learning model. In this model, teachers and students will undergo a transformation in cognition, emotion, and intention, as shown in Figure 2. In the diagram, the behavioral intention of teachers and students is not only influenced by cognition and emotion but also reciprocally affects cognition and emotion [11], creating a cycle of interaction. This helps teachers and students to promote mutual promotion and value co-creation, resulting in the maximization of teaching effectiveness.
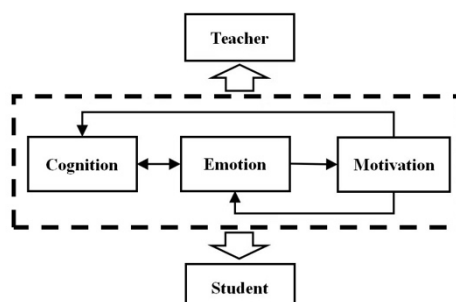


Figure 2 "Cognitive-emotional-intentional" framework

## 3.2 Knowledge Interaction Co-Creating Value Processes in a Blended Teaching Model

Teacher-student value co-creation is a cyclical and interactive process that involves three dimensions. First, the knowledge production and consumption behaviors of participants in the system provide the context for value co-creation[12]. Second, educational value is generated through the knowledge interaction between teachers and students. Finally, teachers and students integrate teaching resources in their interactions to create more teaching value. Based on previous research, this study proposes a dynamic model of how teachers and students co-create educational value through knowledge interaction in blended teaching, as shown in Figure 3. In this process, teachers, as knowledge producers, utilize online teaching resources to create opportunities for co-creation of teaching value; students, as knowledge consumers, acquire, absorb and disseminate knowledge. Both parties continuously engage in knowledge interactions that promote individual cognitive, affective, and intentional development and form a relational experience. In addition, teachers and students co-create practical value,

entertainment value, social value and content value through knowledge interactions, realizing the cooperation, sharing and transmission of educational value under the perspective of co-creative value in blended learning.
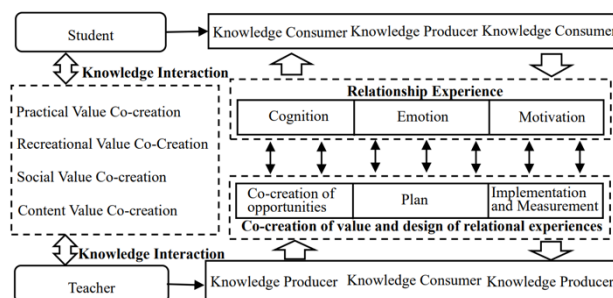


**Figure 3** Knowledge Interaction Model

### 3.3 Co-creation of Value Dimensions in a Blended Learning Model

Co-creation of teaching value can be divided into four dimensions: practical value, entertainment value, social value, and content value[13]. Practical value refers to the functionality of online teaching resources and platform services in the teaching process. Entertainment value refers to the emotional pleasure value that teachers and students derive from knowledge interaction in blended learning mode[14]. Social value refers to the value of connecting with friends, sharing information, and so on. Content value refers to the value demonstrated by the quality of internet resources, online Q&A discussions, and testing tasks in blended learning mode.

### 3.4 Analysis of Influential Factors in a Blended Teaching Model

Behavioral intention is crucial to the implementation of the new teaching model. In the existing studies, Hu Chun et al. pointed out that among the factors affecting behavioral intention, sociality has the greatest influence [15]. In Wang Yano's experimental results, we found that among the factors affecting students' behavioral intention, performance expectation was the most significant [16]. In the studies of Li Ruihong [17] and Huang Yijun [18], we found that effort expectation also had a significant positive effect on behavioral intention. Therefore, in order to more effectively explore the factors influencing teachers' and students' intention to participate in blended learning knowledge interactions, this paper will draw on existing research results and directly select performance expectation, social influence, and effort expectation as the independent variables at the technical level to construct the theoretical model based on the UTAUT2 model.

## 4 Theoretical model construction

Based on the theory of value co-creation, the "cognitive-emotional-intentional" framework and the UTAUT2 model, this paper defines the key influencing factors of technology acceptance in knowledge interaction intention as follows:

Definition 1: Performance expectation. That is, "the extent to which teachers and students believe that using Internet technology services can help them achieve better performance in teaching and learning." This paper hypothesizes that performance expectation will positively influence teachers' and students' behavioral intentions to engage in hybrid instructional knowledge interactions.

Definition 2: Effort expectation. That is, "teachers' and students' perceptions of the ease or difficulty of implementing blended instruction." This paper hypothesizes that effort expectation positively influences teachers' and students' use of blended instruction tools.

Definition 3: Social Influence. That is, "the influence of surrounding groups on the acceptance of new technologies by teachers and students." This paper hypothesizes that social influence positively affects the acceptance of new technology by teachers and students.

In this paper, we constructed a research model based on the intentional factors of knowledge interaction behaviors in hybrid teaching mode from the perspective of educational psychology and the perspective of technology acceptance and use, as shown in Figure 4. Among them, practical value is the value attitude of teachers and students towards the effectiveness of the hybrid teaching mode, entertainment value is the value attitude of teachers and students towards the sensory experience of the hybrid teaching mode, social value is the emotional state generated by teachers and students' knowledge interactions in the hybrid teaching mode, and content value is the sense of identity of teachers and students towards the hybrid teaching mode.
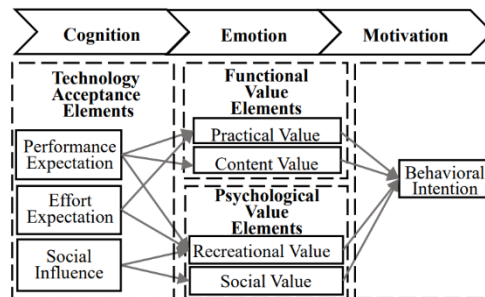


**Figure 4** A Model of Factors Influencing Behavioral Intentions for Knowledge Interaction in a Blended Teaching Model

# 5    Research Methods and Design

## 5.1    QCA Research Methods

Based on the principles of "configuration comparison" and "set theory", this paper employs the qualitative comparative analysis (QCA) method for empirical analysis[19]. With its advantage of not being limited by sample size, this method is used to explain the necessity or sufficiency of the combination factors in producing results, and to provide a more in-depth analysis of the factors influencing knowledge interaction behavior intentions in the mixed teaching mode from the perspective of co-creation value.

## 5.2 Sample Selection

This paper distributed questionnaires to students and teachers from three different types of universities, including Nanchang University, a 211 university, Jiangxi University of Finance and Economics, a regular undergraduate university, and Jiangxi Applied Technology Vocational College, a vocational college. The questionnaires were distributed from September to December 2022, with a total of 200 questionnaires distributed. After excluding invalid questionnaires, 162 valid questionnaires were obtained, including 67 teacher questionnaires and 95 student questionnaires. The majors involved in the study included information management and information systems, finance, mathematics, and computer science.

## 5.3 Variable Design and Measurement

This paper selects seven factors for empirical analysis: performance expectation, effort expectation, social influence, practical value, entertainment value, content value, and social value. Based on the research of relevant scholars, measurement scales were developed. As shown in Table 2, the items numbered with T and S respectively represent the questions for teachers and students, and the items for practical value, entertainment value, and social value are applicable to both teachers and students. All items were measured using a Likert scale, with five attitudes ranging from "strongly disagree, disagree, neutral, agree, strongly agree". The average score of each item under different dimensions was taken as the value of the variable, and the research was conducted based on this[20].

**Table 2** Measurement Variables and Question Setting

| Variant | Number | Question Item |
|---|---|---|
| Performance Expectation (PE) | TPE1 | Blended learning model of knowledge interaction produces better teaching results and higher teaching efficiency |
| | TPE2 | The blended learning model meets my teaching needs |
| | TPE3 | A blended learning model enables efficient use of instructional time |
| | SPE1 | Blended learning models produce better learning outcomes and higher learning efficiencies |
| | SPE2 | Knowledge interaction behavior enhances my personal learning skills |
| | SPE3 | Knowledge interaction promotes self-directed learning |
| Effort Expectation (EE) | TEE1 | The technology required for the blended learning model is easy to master |
| | TEE2 | It was easy for me to develop a blended learning model |
| | SEE1 | I have the ability to use online learning options |
| | SEE2 | I am able to coordinate online and offline learning tasks |
| Social Influence (SI) | TSI1 | If a student recommends a blended learning model to me, I'm happy to try it out |
| | TSI2 | I would be inclined to embrace a hybrid teaching model if everyone around me was practicing it |
| | TSI3 | If a leader or colleague encourages me to use a blended learning model, I will go ahead and use it |
| | SSI1 | If someone who influences me recommends a blended teaching model, I'm happy to try it out |
| | SSI2 | If I had read the publicity related to the blended learning model, I would be inclined to participate in the |
| Practical Value (PV) | PV1 | The hybrid model of teaching and learning can provide quick access to resources and has some practical value |
| | PV2 | Hybrid teaching model provides accurate big data |

| | | functionality that is informative | | |
|---|---|---|---|---|
| Recreational Value (RV) | PV3 | Overall, the blended learning model is practical for me | | |
| | RV1 | Using a blended learning model has made my teaching process fun | | |
| | RV2 | Using the blended learning model is very enjoyable | | |
| | RV3 | Using a blended learning model develops my creative thinking | | |
| Content Value (CV) | TCV1 | Activities such as online video production, discussion and Q&A in blended learning can enhance one's teaching skills | | |
| | TCV2 | The proprietary nature of the data in learner management in a blended learning model can inform instructional decisions | | |
| | SCV1 | The blended learning model of online videos and homework assignments helps me to increase my interest in learning. | | |
| | SCV2 | The blended learning model with online tests and Q&A discussions can help me increase my interest in learning. | | |
| Social Value (SV) | SV1 | Hybrid teaching model of knowledge interaction can enhance the emotional connection between teachers and students | | |
| | SV2 | Blended teaching model knowledge interaction easily builds trust between teachers and students, and among students | | |
| Willingness to Participate (WP) | WP1 | I would like to continue to participate in or adopt the knowledge interaction activities of the blended learning model | | |
| | WP2 | I am willing to participate in or adopt a blended learning model knowledge interaction activity in the future | | |

## 5.4 Tests of Reliability and Validity

In this paper, the validity of the questionnaire was tested by Combined Reliability (CR) and Average Variance Extracted (AVE) and the results showed that the CR values of all variables were greater than 0.7 and the AVE values were above 0.5, thus the questionnaire has good validity. The details are shown in Table 3.

**Table 3** Questionnaire Reliability and Validity Analysis

| Variant | Subject | Cronbach Alpha Coefficient | CR | AVE |
|---|---|---|---|---|
| PE | 6 | 0.872 | 0.846 | 0.526 |
| EE | 4 | 0.920 | 0.812 | 0.537 |
| SI | 5 | 0.717 | 0.796 | 0.512 |
| PV | 3 | 0.948 | 0.788 | 0.596 |
| RV | 3 | 0.779 | 0.823 | 0.646 |
| CV | 4 | 0.908 | 0.845 | 0.688 |
| SV | 2 | 0.887 | 0.851 | 0.641 |
| WP | 2 | 0.862 | 0.838 | 0.673 |

## 5.5 Descriptive Statistics and Calibration of Variables

In this paper, the original variables were first calibrated by transforming the values of the data to be between 0 and 1, and descriptive statistics were performed to improve the accuracy of the calibration. Then, this study used the clear set to use the maximum, minimum, and mean values of the data as the basis for the calibration of the variables. Then, referring to the study of Fiss (2007)[21], combined with the distribution of the sample data, this study selected the upper, middle, and lower quartile values of the sample data as the anchors for the seven condition and outcome variables, as shown in Table 4, where AV means Average Value, FAP means Fully Affiliated Point, and TUP means Fully Unaffiliated Point.

**Table 4** VARIABLE Descriptive Statistics and Anchor Taking

| | Variant | Minimum | AV | Maximum | FAP | Crossroads | TUP |
|---|---|---|---|---|---|---|---|
| | PE | 1.25 | 2.91 | 4.5 | 5 | 4 | 2.11 |
| | EE | 1 | 3.05 | 5 | 5 | 3.5 | 1 |
| | SI | 2.3 | 3.57 | 5 | 4.85 | 3.33 | 1.67 |
| Conditional Variable | PV | 1 | 3.08 | 5 | 5 | 3.5 | 1.45 |
| | RV | 1 | 2.78 | 5 | 5 | 3.75 | 1.225 |
| | CV | 0.75 | 2.93 | 4.5 | 5 | 3.125 | 1.562 |
| | SV | 1 | 2.88 | 4.5 | 5 | 2.5 | 1 |
| Outcome Variable | WP | 1 | 3.18 | 5 | 5 | 4 | 1 |

# 6 Findings and Analysis

## 6.1 Necessity analysis of individual conditions

In this paper, fsQCA3.0 is used to analyze the necessity of each condition, and the results are shown in Table 5, where QX means strong intention to participate, "~" means negative, such as ~ performance expectation means non-performance expectation.

**Table 5** Necessity analysis of antecedent conditions

| Pre-conditions | QX | | ~QX | |
|---|---|---|---|---|
| | Consistency | Coverage | Consistency | Coverage |
| PE | 0.83 | 0.68 | 0.30 | 0.35 |
| ~PE | 0.21 | 0.18 | 0.73 | 0.86 |
| EE | 0.88 | 0.76 | 0.29 | 0.35 |
| ~EE | 0.25 | 0.20 | 0.80 | 0.90 |
| SI | 0.64 | 0.49 | 0.51 | 0.55 |
| ~SI | 0.41 | 0.37 | 0.52 | 0.67 |
| PV | 0.86 | 0.73 | 0.36 | 0.43 |
| ~PV | 0.33 | 0.27 | 0.77 | 0.89 |
| RV | 0.77 | 0.60 | 0.39 | 0.43 |
| ~RV | 0.26 | 0.24 | 0.63 | 0.79 |
| CV | 0.87 | 0.72 | 0.34 | 0.39 |
| ~CV | 0.27 | 0.22 | 0.76 | 0.89 |
| SV | 0.89 | 0.71 | 0.30 | 0.34 |
| ~SV | 0.18 | 0.15 | 0.75 | 0.90 |

As can be seen in Table 5, the consistency indexes of each variable did not exceed 0.9. Only the consistency of Effort Expectation (EE) and Social Value (SV) (0.88 and 0.89, respectively) was close to 0.9. Therefore, this study concluded that Effort Expectation and Social Value are the necessary conditions to drive teachers' and students' participation in the interactive behaviors of blended teaching knowledge. Meanwhile, in the coverage test, the values of effort expectation and social value were 0.76 and 0.71, respectively, with a low percentage of the number of cases that could be explained; and in the test results of the outcome variable of weak willingness to participate, there was no consistency close to 0.9, so it can be preliminarily determined that a single antecedent variable does not have a high degree of explanation for this outcome variable. In contrast, the coverage of non-effort expectation (~EE) and non-social value (~SV) both reached 0.9, which means that these two variables are

sufficient as necessary conditions. Therefore, this study needs to further explore the combinations of factors that influence the intention to interact in hybrid instructional knowledge interaction behaviors.

## 6.2 Sufficiency analysis of conditional grouping

According to Du Yunzhou et al [19], this paper selects 0.8 as the parameter value. Meanwhile, in order to reduce the potential grouping contradiction, this paper takes the consistency score of PRI (Portional Reduction in Inconsistency) as 0.7, and sets the antecedent grouping result greater than 0.7 as 1, and less than as 0. On this basis, this paper obtains the three kinds of grouping results as shown in Table 6. The consistency of these three types of group states is 0.898936, 0.966942, 0.984869 are highly explanatory, and together they affect the behavioral intention of teachers and students in the knowledge interaction in the hybrid teaching mode. The total coverage of the results of the three groupings is more than 0.6, which can explain more than 60% of the cases. The following are the analyses of grouping H1, grouping H2, and grouping H3, respectively.

First, in Grouping H1, regardless of whether teachers and students have high expectations of hybrid educational knowledge interactions or not, when they are not socially influenced, high willingness to participate occurs as long as there is an expectation of effort to realize practical, entertainment, content, and social values.

Second, in Grouping H2, content value has no effect on high willingness to participate, and teachers and students are able to generate high willingness to participate when they have high performance expectations and effort expectations, are socially influenced, and are able to realize practical, entertainment, and social values.

Finally, in Grouping H3, all antecedent variables have an impact on the willingness to engage in knowledge interaction behavior, with effort expectation, practical value and social value having a significant impact.

By comparing the coverage of the above three groupings, this study found that grouping H3 was able to explain 51% of the cases, the highest percentage. Whereas, grouping state H2 can explain 50% of the cases and grouping state H1 can explain 36% of the cases, which indicates that the factors affecting the teachers' and students' intention to participate in blended teaching and learning knowledge interactions have a combination of diversity.

**Table 6 G**rouping results of willingness to interact with knowledge in a hybrid teaching model

| Conditions | Grouping of behavioral intentions to generate knowledge interactions | | |
|:---:|:---:|:---:|:---:|
| | H1 | H2 | H3 |
| PE | | • | • |
| EE | ● | ● | ● |
| SI | ⊗ | • | • |
| PV | ● | ● | ● |
| RV | • | • | • |
| CV | • | | • |

| | | | |
|---|---|---|---|
| SV | ● | ● | ● |
| Consistency | 0.898936 | 0.966942 | 0.984869 |
| Original Coverage | 0.364486 | 0.504673 | 0.514738 |
| Unique Coverage | 0.0718907 | 0.015816 | 0.0258806 |
| Solve for Consistency | | 0.922908 | |
| Solve for Coverage | | 0.602444 | |

Note: ●indicates that the core condition exists, ●indicating that the edge condition exists. $\otimes$ indicates that the core condition does not exist, $\otimes$ indicating that the edge condition does not exist. Blank indicates that the condition has no effect on the results.

## 6.3 Robustness Check

In order to avoid the influence of parameter settings on the results, this paper conducted a robustness test by adjusting the calibration threshold (changing the variable crossing point from 50% to 55%) and the consistency threshold (changing 0.8 to 0.81) to verify the accuracy and robustness of the study [19]. Comparison with the initial results after recalculation using fsQCA 3.0 revealed that there was still no conditional variable with coverage higher than 0.9 in the necessity analysis, and the results of the grouping analysis were also consistent with the three groupings in the initial results. Therefore, it can be concluded that the results in Table 6 are robust to the effect of teachers' and students' intention to engage in knowledge interaction in a blended teaching model.

## 7    Conclusion

This paper explores the factors influencing teachers' and students' intention to participate in knowledge interaction in the mixed teaching mode from the perspective of co-creation of educational value by using the QCA qualitative comparative analysis method, and obtains the following conclusions: firstly, the performance expectation, effort expectation, social influence, practical value, entertainment value, content value and social value can not be individually taken as the necessary conditions influencing teachers' and students' intention to produce knowledge interaction in the mixed teaching mode, which indicates that the individual antecedent conditions have less influence on teachers' and students' intention to generate knowledge interaction; second, there are three paths that determine teachers' and students' intention to generate knowledge interaction, which can be summarized as the influence path of behavioral intention explained by the element of heart value and the element of functional value, the influence path of behavioral intention explained by the element of technological acceptance and the element of psychological value, and the influence path; third, the intention of teachers and students to generate participation in the knowledge interaction of the hybrid teaching model is a synergistic effect of multiple factors, and the influence paths composed of each factor enhance teachers' and students' motivation to participate in different degrees. By comparing the three paths, it was found that effort expectation, practical value, and social value had a significant impact on teachers' and students' intention to generate knowledge interaction. Among them, entertainment value is a marginal condition in all paths, indicating that satisfaction and pleasure play a lesser role in generating teachers' and students' intention to participate in the knowledge interaction of hybrid teaching mode.

However, there are still some shortcomings in this paper. This paper only extracts the antecedent conditions of knowledge interaction intention from the perspectives of teachers and students, and the selection of factors and the design of the model can be further improved. In addition, the number of types of institutions involved in the selection of samples in this paper is relatively small, and the diversity of samples can be improved.

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