Algorithmic Recommendation-Driven Value Cognition in the Practical Teaching of Ideological and Political Theory Courses: Double-Edged Effects and Intervention Paths

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Abstract: *The algorithmic recommendation technology has been deeply involved into the information receiving environment of educational subjects that not only change the way of presenting value issues, but also profoundly influence the construction of value cognition. From the theoretical perspective of the interaction between algorithmic recommendation and value cognition, we explained the generative logic of algorithmic recommendation's embedding in constructing value cognition by analyzing the dual effect (positive empowerment and negative erosion) upon value cognition through three pathways including cognitive focusing, cognitive expansion, and cognitive adaptation; algorithmic recommendation realized positive construction with cognitive damage via information narrowing, preference solidification, and cognitive offloading. By revealing the double-edged effects completely, we proposed intervention paths from three aspects – algorithmic transparency, diversified information exposure, and adjusting recommendation logic, providing theoretical references for the healthy development of value cognition in the algorithmic age.*

Keywords: *algorithmic recommendation; value cognition; double-edged effects; cognitive autonomy; intervention paths*

Introduction

Widespread use of Algorithmic recommendation technology in the information receiving process of educational subjects creates a fundamental technological environment for generating value cognition through tracking and analyzing the behavioral traces of educational subjects, build up dynamic preference profile and achieve personalized information matching. The increase in the efficiency of information acquisition brings about structural changes in the information conditions relied upon for cognitive activities. What is the impact of algorithmic recommendation on value cognition? How does it work, what are the ways by which both positive and negative effects exist became urgent theoretical issues that needed attention. Most of these studies concentrate on the technical principle of algorithmic recommendation or its effect on information dissemination but few discuss the bidirectional mechanism from the internal process of constructing value cognition. We constructed an analysis framework: "generative logic — effect identification — intervention construction" aimed at revealing the double-edged effects of algorithmic recommendation on value cognition and their underlying mechanisms, provide a theoretical reference for preserving cognitive autonomy.

1. The Generative Logic of Algorithmic Recommendation Embedded in the Construction of Value Cognition

1.1 The Operating Mechanism of Algorithmic Recommendation and the Reconstruction of the Cognitive Field

There are three major components of our algorithmic recommendation system including data collection, feature engineering and algorithmic matching. We collect explicit information traces like educational subjects' click behaviors and dwell time in real-time through collaborative filtering and

deep learning models; we build dynamic updates for user preferences profile so that distribute information content personally. The technological settings change the information environment faced by educational subjects value issues. From an active retrieval to passive reception, information structure at the cognitive initiation stage is greatly restructured from the past[1].

Reconstruction of cognitive field highlights deep alterations on path and mode of information arrival: Algorithms alter the visibility of different information elements as well as its relationship with selection, ranking and recommendation mechanism; Frequency, order and context of value issues are regulated through algorithmic logic. The face of information space for educational subjects is not any unprocessed original collection anymore but a pre-arranged pseudo-environment. Basis of value judgment includes the track pre-set by the technological system.

1.2 Technological Mediation in the Generation Path of Value Cognition under Algorithmic Intervention

Technically substantively constructive mediating role of algorithmic recommendation system for generating value cognition: according to the historical behavior data of educational subjects, calculate the relevance weight of content and push certain value issues preferentially into the information interface, downgrade or filter other content. The filtering implies that what value information comes to reach education subjects are not all the situation of the environment, but a subset determined by this algorithm as important or matched, so the composition of cognitive materials is filtered with technology logic.

The deeper impact of technology mediation also reflects that it indirectly directs the cognitive pathway: Algorithms decide how often they are exposed and what situations present value issues to preemptively influence the direction of attention and tendency of judgment of educational subjects without clear intentions – thus surrendering the scope of choice of cognitive objects and comparative frame of reference to the pre-determination of the algorithmic system. Generation of value cognition relies on an active construction of educational subjects only, which is slowly embedded into the information order set by algorithms — Independence and autonomy of cognitive activities undergoes subtle reconstruction.

1.3 The Tension Structure between the Algorithmic Black Box and Cognitive Autonomy

Because of its complexity and lack of transparency, the operation mechanism inside an algorithmic recommendation system is a black box which makes it hard for educational subjects to have a clear cognitive grasp over the screening criteria, ranking standards and weight allocation behind the recommendation results. The black-box effect conceals people's ability to see and correct the structural bias in their information reception process. People's understanding and reflection about what they stand in the information environment gets concealed under the level of technology; the informed premise of cognitive activities get eroded.

The technological obscuring and cognitive autonomy of educational subjects are conflicting; while cognitive autonomy requires educational subjects to independently judge based on complete information, but the algorithmic black box only deprived them of the fundamental explainability of why it is displayed. We have the freedom of choice of information, we are constantly reinforced by our existing tendencies via data feedback mechanism, cognitive activities degenerate from being a construction to passively responding to recommendation results. The essence of the tension structure lies in the internal contradiction between pursuing the efficiency of algorithmic recommendation and safeguarding requirements of cognitive autonomy as the core problem domain for further effect analysis and path exploration for interventions[2].

2. The Positive Empowerment Effects of Algorithmic Recommendation on Value Cognition

2.1 The Cognitive Focusing Effect and the Enhancement of Attention to Value Issues

The algorithmic recommendation based on relevance matching strategy and interest extension strategy intensively gathers all the value issues scattered in the information environment into the cognitive horizon of educational subjects, constantly analyzing the behavior characteristics of educational subjects to screen up and increase the presentation weight of certain value proposition in the information interface so that the value content which has been buried under redundant information

will get a higher exposure frequency and psychological visibility. Finiteness of cognitive resources determines the value sensitivity of allocating attention. Algorithm is a tool guiding attention: reducing the search cost and time cost of finding out and locking on value issues in the sea of information by educational subjects.

Enhancing attention is essential to deepen value cognition. When a specific value proposition has a constant and persistent frequency in the information flow, there is a chance that the cognitive investment of educational subjects on this issue can accumulate and fragmented information exposure will become cognitive attention with a certain degree of continuity. Cognitive focusing due to algorithmic recommendation implies not only repeated information presentation, but also forming an information cluster focused on core value issues through semantic association between contents so as to allow cognitive activities of educational subjects to take place within a relatively intense information environment. The essence of the cognitive focusing effect is to focus limited cognitive resources on information nodes with significant value bearing laying a foundation guarantee of attention for further activities of value understanding and judgment[3].

2.2 The Cognitive Expansion Effect and the Associative Presentation of Multiple Value Perspectives

Algorithmic recommendation system (semantic similarity computation, association rule mining) extending recommendations on value issue cluster associated with the existing cognitive interest of educational subjects: by exploring the implicit associative dimension between contents, connecting information content lying in different knowledge domains possessing an inherent value relevance allowing educational subjects, while attending to a certain value proposition, to be exposed to its various expressions in different contexts. Cross-domain association mechanism overcome limitations of traditional information acquisition method showing value issues isolated from one another, expanding the scope of reference information upon which educational subjects rely for their value judgment.

The other presentation of various perspectives gives comparative and integrative cognitive momentum for value cognition: when faced with presentations of value issues according to different information sources and discursive frameworks, the cognitive activities of educational subjects will inevitably involve multidimensional comparison and contrast – the cognitive narrowness due to one perspective has acquired a structural hedging mechanism (at the level of information supply). Associative presentation forces educational subjects to search for meaning coordinates of a given value proposition in a broader semantic network; value judgment gets a cognitive base going beyond limiting a single information source. Comparative space and integrative possibilities offered by the cognitive expansion effect allow value cognition to pass from isolated judgment towards an associative understanding without losing its open dimension which should be possessed by the cognitive structure under the guarantee of diversity in information supply.

2.3 The Cognitive Adaptation Effect and Individualized Paths of Value Understanding

Algorithmic recommendation system dynamically adjust information presentation based on people's cognitive characteristics to achieve a dynamic matching between the presentation mode of value issues and the acceptance level of educational subjects. Based on the analysis of information processing habits, cognitive load tolerance threshold and existing knowledge reserve state of educational subjects, they are differentiated by presentation difficulty, information density and depth of interpretation, present the same value proposition to educational subjects with different cognitive endowment through different entry points for their understanding and cognitive path[4].

Importance of such kind of adaptation is respect to the objective existence of individual difference on the way of developing value cognition. The different cognitive style, information processing speed and previous knowledge structure of educational subjects will lead to the non-identical path of understanding and pace of internalizing about the same value issue. Dynamically adapting information presentation strategy enables educational subjects at different stages of cognitive development to have a channel for value understanding suitable to their present cognitive level so as to avoid the cognitive barrier caused by mismatching information presentation mode and cognitive characteristics. Cognitive adaptation refers to making the generation of value meaning be consistent with people's real ability of comprehension; transforming value cognition changing from receiving uniform information to constructing it individually, optimize the smoothness and individual appropriateness of the construction of value cognition at an overall level.

3. The Negative Erosion Effects of Algorithmic Recommendation on Value Cognition

3.1 Information Narrowing and the Risk of the Contraction of the Horizon of Value Cognition

The algorithmic recommendation system screen based on the history of behavior of educational subjects enhances its relevance while creating a self-reinforcing loop pushing the content which is highly congruent with existing interests but filters out anything that doesn't fit their preferences. The value information received by educational subjects narrows down into a narrow range set by established preferences – each click and dwell reinforces the system's preference determination, narrowing the recommendation scope even further.

The long term shrinking of information accumulation brings about the shrinkage of the frame of reference for value cognition. The persistent lack of cross-stance cognitive references results in a framework of value judgment without input and correction from external information, contraction of the cognitive horizon leads to an open dimension which is supposed to exist in the structure of value cognition degenerate gradually. The gradual contraction of the horizon can hardly be sensed until when educational subjects meet with heterogeneous value information they realize their situation of cognitive closure[5].

3.2 Preference Solidification and the Weakening Mechanism of the Elasticity of Value Judgment

Algorithmic recommendations reinforce the current information selection tendency and provide a continuous positive feedback-style confirmation for cognitive preferences. Because they depend upon history, the content recommendations follow the direction of existing selections; each recommendation reinforces the cognitive schema of original preferences. The judgment mode of educational subjects faced with value issues will be anchored to the track set by initial preferences. Value information not conforming to this track is hard to get enough cognitive processing.

The preference solidification reduces the adaptability of value judgment in face of changing situations. The elasticity of judgment relies upon continuous supply of heterogeneous elements within the cognitive structure. With homogeneous information input continually reinforced by algorithmic recommendations, the heterogeneity decreases so that the value judgment lacks an internal impulse to change with new information coming along. It turns from a dynamically adjusting open system to a fixed response pattern, which will eventually dissolve its ability for self-renewing because of the continual reinforcement of preferences.

3.3 Cognitive Offloading and the Dissolution Tendency of the Depth of Value Reflection

Replacing the screening and evaluation performed by educational subjects during their acquisition stage through a pre-arranged information filter, the cognitive load moves towards the technological side: Educational subjects no longer have to autonomously judge if an information is reliable/relevant as this was already determined by the algorithm prior to arrival. Participation of critical thinking for receiving value issues drastically reduce; educational subjects follow what is presented by the algorithm and its implicit presuppositions.

Dissolution of reflective depth leads to value cognition in a shallow state of passive reception. If smooth flow of information comes into the cognitive system then there will not be any urgency for the educational subjects to explore this information and replace it by cognitive inertia. Value cognition descends from an active construction of meaning to passively receive information; Lack of intellectual depth required to go beyond information reception towards value generation. Algorithmic recommendations are a factual dissolution of the depth of value reflection.

4. Intervention Paths for the Protection of Value Cognition in the Era of Algorithmic Recommendation

4.1 Algorithmic Transparency and the Enhancement of Cognitive Risk Perception Ability

If not knowing how algorithmic recommendation systems work in education, we will hardly be able to see or resist its biasing effect on our cognitive activities. The enhancement of algorithmic transparency means disclosing to educational subjects the main basis and influencing factors of the recommendations decision for them to understand the generative background and screening logic

behind the value information that they receive, thereby restoring their feeling of having cognitive control over the information environment. We don't need to show all the technical parameters of an algorithm; rather we just explain the result of recommendation: Educational subjects should know why a certain piece of content has been recommended according to what standards it has been ranked and which of their own behavior characteristics have influenced the recommendation results.

Having been aware of the biasing mechanism in algorithmic recommendations, how we judge educational subjects facing recommended information have changed greatly: Cognitive subjects with risk perception ability will not consider the recommended content is the whole picture of information environment but realize it's just a certain subset after being filtered by algorithms and keep a necessary cautious attitude throughout the process of receiving information. Education subjects enhance their risk perception ability actively inquire into the source composition of recommended content and possibly missing information dimensions; Value judgment based upon this inquiry has cognitive depth that surpasses algorithmic presumptions, there exist a chance for recovery of cognitive autonomy via transparency[6].

4.2 Diversification of Information Exposure and the Elastic Construction of Cognitive Structure

Extending the scope and sources of value information exposure will balance against the tendency towards preference reinforcement which is present in algorithmic recommendation mechanisms. Education subjects need to break out the information boundary set up by algorithmic push; bringing forth value perspectives contrary to their current preferences, avoiding loss of the self-renewing ability of cognitive structure caused by being exposed to a homogenized information environment over time. Specific operations of diversification exposure strategies include but are not limited to: actively search for information contents beyond the recommendation feed, pay attention to value discourses from different stances or often check the composition structure of one's own information reception.

The essence of constructing cognitive structure in elasticity is to create a mechanism of comparing and cross-validating various kinds of value information. Facing the continuous exposure of heterogeneous value information, we should integrate and adjust our cognitive structure under the pressure of inconsistent information input; it is exactly what drives the development of cognitive elasticity. The flexible ability of adjusting an elastic cognitive structure to value judgment framework with changing information environments avoids us becoming rigid because of relying too much on one information source. A diversified information supply and elastic cognitive structure provides an internal defense line to avoid the erosion of algorithmic bias such as value cognition has the ability for self-correction and dynamic development in an open information environment.

4.3 Adjustment of Recommendation Logic and Institutional Safeguards for Cognitive Autonomy

Technical system: Adjusting the goal of algorithmic recommendation, embedding the protection of cognitive diversity in the optimization objective system of recommendation systems so as to dynamically balance between the efficiency of information matching and cognitive autonomy; adjustment methods are including adding an incentive mechanism for interest exploration (active insertion of value information which has a relatively large degree of difference from the user's current preferences), or setting balanced constraints on content categories (to ensure that the distribution of recommendations across different value dimensions maintain a certain ratio without being dominated by content of one dimension).

The safeguarding of cognitive autonomy means emphasizing on the cognitive rights and interests of educational subjects when designing technologies. Adjusting the logic of recommendations is actually changing the long-term value of algorithmic recommendation, i.e., a healthy cognitive environment needs not just an accurate match with information, but diverse conditions for cognitive development. Institutional safeguards mean establishing the protection of cognitive diversity as a basic constraint condition of algorithm design so that recommendation systems can transform their instrumental logic which solely aims at seeking immediate satisfaction into a value logic which takes the maintenance of cognitive autonomy too; the synergy between technology and institutions is a system safeguard for maintaining the healthy development of value cognition.

Conclusion

According to the theory of interaction between algorithmic recommendation and value cognition,

we discuss its generative logic, bidirectional effects and intervention path when algorithmic recommendation embedded in constructing value cognition: technologically mediating for generating value cognition; the algorithmic recommendation system can realize positive empowerment of value cognition through cognitive focusing, cognitive expansion and cognitive adaptation enabling educational subjects to gain technological benefit (depth of attention to value issues, breadth of reference, and appropriateness of understanding) while facing structural erosion risk about aspects such as openness of horizon, elasticity of judgment, and depth of reflection because of the three mechanisms of information narrowing, preference solidification, and cognitive offloading. Impact of algorithmic recommendation on value cognition is an interwoven and coexisting double-edged effect depending upon the interactive balance between the orientation of technological design and the coping strategies of subjects. Based on it, we put forward intervention paths from three dimensions—algorithmic transparency, diversification of information exposure, and adjustment of recommendation logic which are functional complement each other and play respective role in cognitive risk perception, elasticity of cognitive structure, and algorithmic objective constraints. We will be interested in studying the differential effects of different recommendation architectures, explore the operationalization of intervention schemes, track the dynamic evolutionary pattern of the structure of value cognition with long-term algorithmic exposure in our future researches.

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