



## Original Article (Mixed)

# Design and Validation of a Systems Thinking Curriculum Model for the First Year of High School Based on the Heutagogy Approach

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**Abstract**

The present study was conducted with the aim of designing a systems thinking curriculum model with the heutagogy approach in the first year of secondary education. This research was applicable in terms of its purpose, and mixed with an exploratory design in terms of its implementation method, carried out in two qualitative and quantitative parts. In the qualitative part, 8 experts in educational sciences and psychology were interviewed using purposive sampling and until theoretical saturation. The data were examined using the content analysis method, and basic and organizing themes were extracted. In the quantitative part, the statistical population included first year secondary education teachers in Alborz province in the academic year 2023-2024. Sampling was done in a multi-stage cluster manner and the data collection tool was a researcher-made questionnaire derived from qualitative findings. The validity of the tool was confirmed by the internal consistency method and reliability with Cronbach's alpha of 0.98. Descriptive indices, single-group T-test, and structural equation modeling with SPSS and Amos software were used to analyze the data. The results showed that 26 basic themes were identified in 7 organizing themes in the "curriculum" dimension, 15 basic themes were identified in 5 organizing themes in the "implementation requirements" dimension, and 23 basic themes were identified in 8 organizing themes in the "implementation effects" dimension. Also, from the teachers' perspective, the most importance was given to foresight, process management, and understanding complexity, respectively among the dimensions of the heutagogic systems thinking curriculum. The functional dimensions, understanding educational and structural relationships were the most important in the implementation requirements, and the growth of academic capabilities, promotion of students' types of thinking, and improvement of teachers' teaching competence were the most prominent results in the implementation effects.

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## Extended abstract

### Introduction

The concept of learning has changed in the information age and how learning is considered, and this new learning emphasizes the development of learners' ability to transform information into knowledge. The new era demands new education. Education appropriate to the present era must be based on customer orientation. To meet this need, a paradigm called the learning-centered paradigm is proposed in which, instead of focusing on providing educational materials, attention is focused on meeting the needs of the learner.

In this approach, learning is nonlinear, multidimensional, and networked and is formed based on the needs, interests, previous experiences, and cultural and social context of the individual. From this perspective, learning focuses more on the development of capabilities rather than just skills. Capabilities are a combination of knowledge, skills, attitudes, and the ability to use them in new and complex situations (Ghalandari et al., 2023).

Saeedavi et al. (2024) conducted a study titled "Identifying and Explaining the Strategic Facilitating Factors of Hyatagogy in Managerial Education" using a descriptive-analytical method and a researcher-made questionnaire. The results showed that six strategic factors including learning leadership, flexible executive-educational structures, creating an electronic infrastructure and platform, managers' ability to use electronic equipment, creating an organizational climate for knowledge sharing and feedback are among the most important factors facilitating the implementation of the hyatagogy approach, which explain 64.75% of the total variance.

Nikmohammadi et al. (2023) conducted a study titled "Identifying the Dimensions and Components of Hyatagogy Curriculums in the Second Period of Secondary Education" using a descriptive-analytical method. The findings showed that the main dimensions of the heutagogic curriculum include flexibility in goals and programs, comprehensive goal-setting framework, production of applicable and skill-based content, self-determined learner, creative collaborative participation, heutagogic teacher skills, technological classroom, systems thinking, critical thinking, and heutagogic assessment.

### Research Method

In this study, a mixed method with an exploratory design and an instrument development model was used, so that data were collected sequentially and with equal importance through a combination of qualitative and quantitative data. In the qualitative section, the research community included 8 experts and university professors in the fields of curriculum planning and educational psychology, which was done with purposive sampling. The validity of the qualitative findings was measured with the criteria of reliability, transferability, relevance, and confirmation.

In the quantitative part, a questionnaire consisting of 64 items in 20 dimensions and 4 main factors was designed based on the indicators obtained from the qualitative phase and distributed online among 178 secondary school teachers. Responses were collected on a 5-point Likert scale. The validity of the questionnaires was confirmed by experts and their reliability was examined with Cronbach's alpha coefficient, which was 0.96 for the variables of the curriculum and implementation requirements and 0.97 for the implementation effects. The collected data were analyzed using SPSS software and descriptive and inferential statistics methods, and Amos software was used to draw the model.

### Findings

The research findings showed that the curriculum model of systems thinking with a heutagogy approach includes the components of structural reform, process management,



modern education, research, application of technology, foresight, and understanding of complexities; and these elements synergistically increase the quality of learning and self-management of students. Also, the implementation requirements included structural, legal, functional, holistic aspects, and understanding of educational relationships; and the effects of program implementation were identified, including the growth of students' social, psychological, and thinking capabilities. The results showed that reforming the educational structure and managing processes with student participation and self-reflection, modern education and teacher facilitation, the use of technology and a research environment, and a focus on foresight provide the basis for the realization of systems thinking. The findings are consistent with previous studies in the field of heutagogy and constructivist education and show that the combination of these approaches strengthens the agency, self-management, and analytical and systemic skills of students.

### Discussion and Conclusion

The results showed that “educational structure reform” through decentralization, structural reengineering, and constructivist design is the main prerequisite for institutionalizing systems thinking in schools. This approach transforms the structure of education from hierarchical models to a participatory and dynamic system. The present result is consistent with the findings of Saeedavi et al. (2024) who considered structural flexibility and learning leadership as strategic factors for implementing the heutagogy approach. It is also consistent with the results of Nikmohammadi et al. (2023) who introduced “flexibility in goals and program management” as essential components of the heutagogy classroom. Therefore, structural reform not only contributes to the equitable distribution of power in decision-making, but also provides a platform for the emergence of student self-determination and agency.

Managing educational processes centered on student participation, self-reflection, independence, and choice was a key element of the proposed model. This component is deeply linked to the philosophy of heutagogy, because in it the learner is responsible for his or her own learning path. The findings are in line with the results of Ebili et al. (2021), who considered self-learning and self-direction as central components in e-learning platforms. It is also consistent with Handayani et al. (2022), who showed that heutagogy increases the self-efficacy and independence of learners. As a result, managing processes in a participatory and open manner can strengthen the spirit of self-management and feedback in the teaching-learning process.

Modern education in this model includes components such as teacher facilitator, holistic view, active teaching, and flexible content. This finding is consistent with the results of Alfares et al. (2024) and Alzubi et al. (2024) who introduced the role of the teacher in constructivist education as “guide and facilitator”. In this study, the emphasis on interaction, feedback, and learning design based on the real needs of the learner creates a synergistic approach between systems thinking and heutagogy. Therefore, modern education plays a fundamental role in transforming the classroom into a self-organizing, dynamic, and multidimensional environment in which the teacher is no longer just a source of knowledge, but also a facilitator of learning. The results showed that creating a digital research environment and research foresight are effective paths in realizing systems thinking. The findings are consistent with the study of Goode et al. (2023) who introduced research-based learning as a factor in increasing students' analytical and problem-solving abilities. It also has a clear coherence with the view of Nikmohammadi et al. (2023), who considered “research and learner agency” as key components of heutagogy. In this model, research is not simply a scientific activity but also a tool for cultivating a networked and multidimensional view of phenomena.



The use of mobile learning technologies and virtual scientific networking is a requirement of the systems thinking curriculum. This finding is in line with the research of Ebili et al. (2021), who emphasized the role of technology in enhancing self-learning and self-direction. In the context of heutagogy, technology is not only a teaching tool but also a platform for systemic interactions and continuous feedback. This allows students to practice thinking, analysis, and modeling through online platforms.

The present model emphasizes teaching foresight skills, teachers' capacity for future-oriented thinking, and creating developmental thinking in students. These findings are consistent with the research of Shafiey et al. (2021), who introduced a future-oriented understanding of the difficult but crucial components of learning systems thinking. In this regard, combining heutagogy with foresight allows learners to see themselves as participants in the design of their educational future, rather than simply consumers of knowledge. Teachers' understanding of complex environments and their holistic view of relationships within the education system were important findings of the research. This is consistent with the findings of Yaylor et al. (2020), who considered systems thinking to be a multilevel process involving sensitivity, literacy, and capability.