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Designing a Heutagogy Curriculum Template for the Second Level of High School

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ABSTRACT

Objective: The current research was conducted with the aim of designing a Heutagogy curriculum model for the second level of high school in Tehran.

Methods: The method of this research is applied in terms of purpose and it was done in an exploratory way that in the qualitative part of the method of thematic analysis and research synthesis and the quantitative part was based on structural equation modeling, the method of data collection was done in a mixed method (quantitative and qualitative) and the research tools in the qualitative part were semi-structured interviews and questionnaires and in the quantitative part. The questionnaire resulted from the qualitative phase. In the qualitative section, the Lausche coefficient (CVR) was used to check the content and Cohen's kappa coefficient was used to check the reliability. In this section, to validate the designed model, experts in curriculum and educational psychology completed the relevant questionnaire. In the qualitative section, data analysis was carried out using thematic analysis and research synthesis based on basic themes, organizing themes, and comprehensive themes. The quantitative part was based on structural equation modeling. The statistical population of the quantitative part includes all the secondary school teachers of Tehran city, who were selected using Cohen's formula, with a sample size of 198 people.

Results: At first, the fit of the models related to each of the elements was extracted and at the end, the overall fit of the model was confirmed. The research findings were based on the results of qualitative and quantitative analyzes of the eight elements of flexibility, purpose, educational technology, thinking, facilitation, learner, content and Evaluation for heutagogy curriculum was identified in the second year of high school. Each element had dimensions and components; the total number of identified dimensions was 28 dimensions.

Conclusions: The findings predominantly corroborate the formulation of a heutagogy curriculum for the second level of secondary education.

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Introduction

In light of the fact that we inhabit an era characterized by the proliferation of knowledge, marked by incessant transformation and pronounced diversity, it becomes imperative for individuals to possess the capacity to generate, utilize, and disseminate knowledge; hence, it is essential for humanity to perpetually acquire the requisite competencies of the 21st century. Furthermore, the evolution of educational culture to adequately meet the requisites of the 21st century is a complex process that imposes the obligation of identifying, executing, attaining, and sustaining the educational outcomes pertinent to the 21st century upon the educational framework, curricula, and pedagogical training; this is primarily because the objective is for learners to comprehend the competencies of the 21st century in relation to literacy, abilities, and skills (Al Kandari & Al Qattan, 2020). Within the educational framework, the curriculum emerges as the most pivotal component, possessing a critical and irrefutable influence in the realization of the objectives and purposes of this framework. The curriculum is defined as a collection of systematic and orchestrated educational opportunities (encompassing national, regional, and local tiers down to schools and classrooms, catering to a broad spectrum of audiences and learners, as well as more limited groups) along with the resultant outcomes that educators necessitate to acquire the essential competencies required for understanding and addressing the situational corrections in accordance with the Islamic standard system, thereby enabling continuous development and enhancement of their identities, facilitating an acceptable level of preparedness for achieving a prosperous life across all dimensions (Mehdizadeh, 2019). Among the competencies integral to the learning process is the heutagogy approach, which equips individuals to proficiently address their needs, particularly in alignment with perpetually evolving conditions (Blaschke, 2012; Zakareya & Al-Qahtani, 2020). Heutagogy represents a comprehensive model of self-directed learning introduced by Hayes and Kenyon. The foundational principles of heutagogy are deeply embedded in andragogy, positioning the learner at the core of the educational experience (Blaschke, 2012; Moore, 2020). The underlying philosophy of heutagogy is grounded in learner-centeredness, permitting both students and educators to adopt this paradigm in their instructional and educational endeavors (Abraham & Komattil, 2017; Chimpololo, 2020).

Based on the findings of the researchers, a curriculum that incorporates a heutagogy framework enhances the knowledge discovery capabilities and self-determination of students throughout their

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learning journeys (Jomhor et al., 2020; Shafiei & Bakhshi Manesh Gashti, 2018). The process of learning through heutagogy accentuates the enhancement of learners' proficiency in converting information into knowledge (Solaymani et al., 2015). Heutagogy contributes to the augmentation of students' self-efficacy, empowering them to take charge of their own educational journey while also facilitating opportunities for students to reflect on their learning processes and methodologies (Booth et al., 2017). Heutagogy nurtures collaboration among learners, enhances their critical thinking capabilities, and instructs them against the uncritical acceptance of information ((Chimpololo, 2020). The essence of learning, as manifested through heutagogy or self-determination, cultivates problem-solving skills in students and equips them to confront social challenges and behaviors (Nadelson et al., 2015). Simultaneously, heutagogy facilitates the learner in cultivating their cognitive space, and the learner, embodying the role of a "learning architect," enhances their educational journey. Fundamentally, the implementation of the heutagogy learning paradigm within the educational framework is vital for the acquisition of competencies requisite for thriving in a competitive global society (Halsall & Snowden, 2017).

The researcher posits that the heutagogy learning approach holds significant relevance in the context of secondary education. This assertion is predicated on the understanding that during this developmental stage, individuals experience the comprehensive maturation of their cognitive faculties, thereby maximizing their capacity for learning. The curiosity inherent in adolescents becomes increasingly focused. Young individuals begin to contemplate profound existential matters. The adolescent's reliance on parental guidance diminishes, while their aspiration for autonomy intensifies. Concurrently, there is a burgeoning appreciation among teenagers for cultural, artistic, and scientific endeavors. During this developmental phase, adolescents transition into the realm of abstract reasoning, resulting in a substantial expansion of their intellectual and cognitive capabilities. In light of these transformations that transpire in individuals during adolescence (specifically, the second secondary stage), one must inquire whether our educational system has adequately fostered teenagers in such a manner that they actively pursue broader learning opportunities, beyond the confines of conventional school curricula. Are they acquiring the ability to learn through diverse methodologies or not? Particularly, the contemporary adolescent is equipped with cutting-edge electronic devices and possesses the capability to utilize these tools for educational purposes. Consequently, the principal focus of this research pertains to

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the integration of the heutagogy approach within the curriculum, raising the question of what type of heutagogy curriculum model can be developed for the second year of high school, given that the heutagogy approach emphasizes the enhancement of the learner's capabilities, prioritizes the selection of learning content in accordance with the learner's needs, and eschews the traditional teacher-centered educational paradigm. Moreover, in light of the evolving understanding of "learning" in the information age, where "learning how to learn" has garnered significant attention, what innovative heutagogy curriculum frameworks can be conceived for this educational stage?

Material and Methods

Considering that the primary objective of the present research is to develop a Heutagogy curriculum model (case study: second-year secondary schools in Tehran), the methodology employed in this research is applied in nature with respect to its objective and was executed in an exploratory manner. Additionally, the method of data collection was conducted utilizing a mixed-method approach (both quantitative and qualitative), and the instrument for data collection consisted of interviews with experts who possess extensive knowledge and proficiency regarding the subject matter of the research, along with a credible scientific or empirical background in this domain. Furthermore, a degree of inferential analysis, data description, and factor analysis will be employed to interpret the questionnaire data and present the findings.

Study population, sample size, and sampling methodology: In the qualitative component, the population comprised experts in the domains of curriculum studies and educational psychology, of which 18 to 20 individuals had conducted research and authored articles pertinent to the topic, and interviews were carried out until saturation was observed. In the quantitative segment, the statistical population included educators teaching at the second secondary level in public schools in Tehran; for their selection, cluster and random sampling techniques were utilized. The sample size in this area was computed online employing Cohen's formula. Consequently, the number of questionnaires disseminated among the second-year high school educators in Tehran amounted to 250, with a final total of 198 questionnaires subjected to analysis.

Data collection instruments: In this study, in order to comprehend the conceptual and theoretical foundations pertaining to "heutagogy," literary texts and articles within this field were employed

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through library methods (including books, reputable scientific databases, etc.), in addition to interviews and researcher-developed questionnaires.

Validity and reliability of the data collection instrument (validity of the questionnaire): Given that the content of the questionnaire reflects the components with the highest significance coefficient, and based on the validation of the questions by the experts, the content validity of the questionnaire has been affirmed. Initially, Cronbach's Alpha was calculated to establish the reliability of the questionnaire for the purpose of conducting statistical analyses. Cronbach's alpha serves as a metric for assessing the one-dimensionality of attitudes, judgments, and other constructs that are challenging to quantify. A higher positive correlation among the questions correlates with a higher Cronbach's alpha, whereas an increased average variance among the questions results in a lower Cronbach's alpha. The findings indicate that the alpha coefficient for the entire questionnaire stands at 0.94 signifying that the employed instrument exhibit's commendable reliability.

The evaluation of the gathered data was conducted in the qualitative segment through the implementation of thematic analysis and research synthesis methodology. This approach was grounded in the framework established by Attride-Stirling et al. (2004), which facilitated the development of a thematic network derived from fundamental themes. The analysis included both organizing themes and inclusive themes. In the quantitative segment, both descriptive and inferential statistical methods were executed utilizing SPSS and Amos software. A structured questionnaire was employed, and the data underwent inferential analysis through the application of factor analysis methodology.

Results

Analysis of the qualitative part

In the qualitative part of the data obtained from 22 people, interviews with experts and specialists and selected studies were conducted in line with the general goal of the research, which is to design a heutagogy curriculum model for the second year of secondary school, using thematic analysis and focus research. This analysis was carried out by separating the research questions in the four stages of extracting terms and primary codes, setting basic, organizing and comprehensive themes, and drawing a network of themes. In the theme analysis, after extracting scientific bases from

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previous studies and researches and conducting interviews with experts and specialists and writing them down, conceptual phrases and basic codes were extracted and initial codes were set. In the following, according to the extracted primary codes, basic and organizing themes were set. Finally, the theme network was drawn for each extracted element separately. In the following, the process of analyzing the theme and drawing the network of themes is presented.

Table 1. Themes extracted from qualitative analysis (heutagogy approach)

Overarching theme: flexibility
Organizer theme 1: flexibility in goals Basic themes: 1. Education of a flexible mind, 2. Expansion of mental capacities Organizer theme 2: Flexibility in programs Basic topics: 1. 1. Non-linear programming, 2. Variation in programming, 3. Flexibility in program implementation. Organizer theme 3: flexibility in management Basic themes: 1. Open attitude of the educational system, 2. Fluidity in classroom administration, creation of knowledge in the classroom
Overarching theme: Purpose
Organizing Theme 1: Heutagogy Targeting Platform Basic themes: 1. Attention to changes in goal setting, 2. Goal setting considering the unknowns of the future, 3. Shaping new educational structures Organizing Theme 2: Holism in Goal Setting Basic themes: 1. All-round goal setting, 2. Unique goal setting, 3. Learning goal setting, learning method, 4. Group thinking goal setting, 5. New knowledge in goal setting.
Overarching theme: Content
Theme of the organizer 1: Extent of content: Basic themes: 1. Diversity of content, 2. Scientific research of content, 3. Beyond the book Organizer theme 2: content creation Basic themes: 1. Teacher and student shared content production, 2. Learner content production, 3. Group content production, 4. Learning content production methods, 5. Content production supervision. Organizer theme 3: Functional content: Basic themes: 1. practical content, 2. special content for writing skills, 3. internship-based content, 4. content that stimulates learning conversations, 5. operationalization of content Organizer theme 4: skill content: Basic themes: 1. The content of life-social skills 2. The content of communication-cultural skills 3. The content of professional skills,
Overarching theme: learner
Organizing theme 1: self-determined learner: Basic themes: 1. Selective learner, 2. Inquiring learner, 3. Searching learner, 4. Planner learner Organizing Theme 2: Creative Collaborative Partnership: Basic themes: Cooperation in learning, 2. Collaborative creativity, 3. Team activities Organizer theme 3: learner agency: Basic themes: 1. Self-development, 2. Designing learning activities, 3. Uniqueness of the learner, 4. Non-linear learning, 5. Deep learning, 6. Applying skills. Organizing Theme 4: Intrinsic Motivation: Basic themes: 1. Innate desire to learn, 2. Applying the learned
Overarching theme: Facilitation
Organizing theme 1: Heutagogy class: Basic topics: 1. Constructivist class 2. Challenging class 3. active class Organizing Theme 2: Heutagogy Teachers' Skills

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Basic topics: 1. Facilitation skills 2. Skill in various teaching methods 3. Electronic skills for teaching 4. Social skills 5. Teacher's learning ability 6. Teacher's critical thinking 7. Teacher's systemic thinking Theme of organizer 3: original teaching: Basic topics: 1. Observation in the real environment 2. Practical exercise in class 3. Student involvement 4. Discussion about production learning contents Organizing theme 4: creating opportunities for students: Basic topics: 1. Self-determination opportunity 2. Giving opportunity for creativity 3. Creating academic conflict 4. Creating deep understanding 5. Creating internal motivation 6. Creating an atmosphere of cooperation 7. Note the approximate area of growth Organizing theme 5: Teaching Heutagogy skills Basic topics: 1. Teaching problem solving 2. Teaching the student 3. Teaching learning design skills
Overarching theme: educational technology
Theme of the organizer 1: technological class Basic themes: 1. Digital learning, 2. Digital teaching, 3. Digital library, 4. Design and production of digital content, 5. Educational technologist learner. Organizer Theme 2: Technological Educational Tools Basic topics: 1. Web teaching tool 2, 2. Cloud space, 3. Mobile technology Theme of organizer 3: Social media Basic themes: 1. Learning interaction through media, 2. Wide/Open Learning Community, 3. Integrating social media and Curriculum, 4. Media Mediation
Overarching theme: thinking
Organizing theme 1: Systemic thinking Basic topics: 1. Strengthening systemic thinking 2. Foresight 3. Understanding the complexities 4. Learning to understand the relationships between phenomena Organizer theme 2: Critical thinking: Basic themes: 1. Learning critical analysis and interpretation 2. Critical review and evaluation Organizing theme 3: group thinking Basic themes: 1) 1. Thoughtful search 2. Cooperation in thinking
Overarching theme: evaluation
Organizing theme 1: Heutagogy assessment: Basic topics: 1. Flexible measurement 2. Negotiation assessment 3. Original measurement 4. Continuous measurement 5. Dialectical assessment 6. Peer measurement 7. Social assessment 8. Action-oriented assessment 9. Parent assessment Organizer theme 2: The teacher's role in assessment: Basic topics: 1. Reviewing programs 2. Providing feedback 3. Various evaluations according to the objectives Organizer theme 3: The student's role in assessment: Basic topics: 1. Continuous student self-evaluation 2. Learning from mistakes 3. Metacognition in measurement 4. Active participation in assessment Organizing Theme 4: Choice in Measurement: Basic topics: 1. Independence of the teacher 2. Student independence 3. Measurement contracts

Draw a network of general model themes

Examination and analysis of experimental and theoretical texts led to the formation of 8 main elements. Each element had different components and dimensions, which were presented in the form of organizing themes and basic themes. At this stage, to consolidate and summarize the above models, a main and general model for the heutagogy approach for the second period of high school is presented.

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Table 2. Themes extracted from qualitative analysis (heutagogy approach)

Heutagogy approach model for the second level of high school
Overarching theme: flexibility Themes of the organizer: 1. Flexibility in goals, 2. Flexibility in plans, 3. Flexibility in management Overarching theme: Purpose Organizing themes: 1. Heutagogy goal setting platform, 2. Comprehensiveness in goal setting. Overarching theme: Content Themes of the organizer: 1: content breadth, 2. content production, 3. practical content, 4. skill content Overarching theme: learner Organizing themes: 1. Self-determining learner, 2. Creative cooperative participation, 3. Learner agency, 4. Intrinsic motivation. Overarching theme: facilitation Organizing themes: 1. Heutagogy class, 2. Heutagogy teacher skills, 3. Authentic teaching, 4. Creating opportunities for students, 5. Teaching Heutagogy skills. Overarching theme: educational technology Themes of the organizer: 1. Technological classroom, 2. Technological educational tools, 3. social media. Overarching theme: thinking Themes of the organizer: 1. System thinking 2. Critical thinking 3. Group thinking Overarching theme: evaluation Organizing themes: Heutagogy assessment, 2. teacher's role in assessment, 3. student's role in assessment, 4. choice in assessment

Quantitative segment analysis

In the qualitative part, the elements of the heutagogy approach curriculum for the second year of high school were identified, and in the quantitative part, the fit of the models was confirmed for each element with confirmatory factor analysis. According to the results of the qualitative and quantitative analyzes that were done to fit the models, the model of heutagogy approach for the second period of high school is presented in figure 1.

In total, according to the results of qualitative and quantitative analysis, 8 basic elements were identified in the curriculum of heutagogy approach of the second year of high school, and each element had dimensions and components. Considering the wide range of dimensions and components, at this stage, the values of each element were added together and examined in the form of an indicator variable in the overall pattern.

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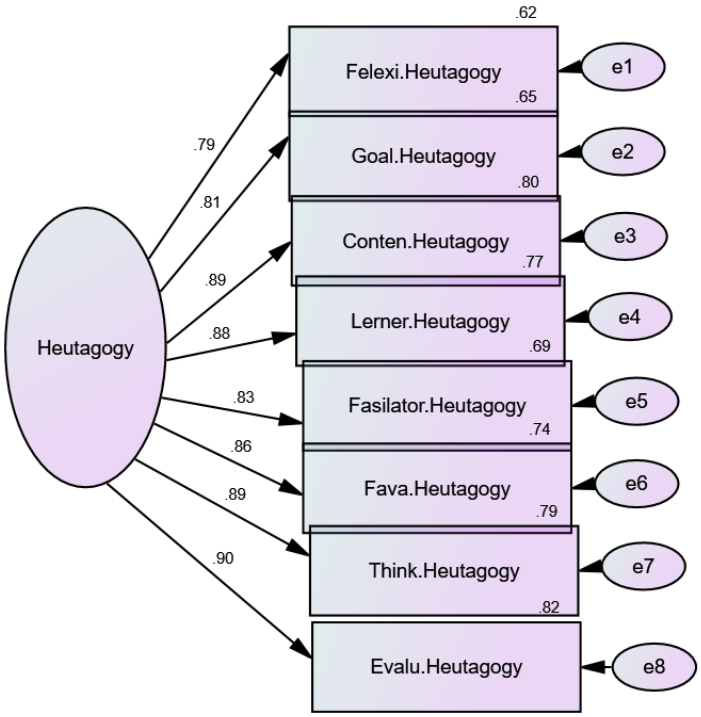

Figure 1. Overall fitted model by elements

According to the examination of the model with experimental data, the model related to the elements of heutagogy approach for the second period of high school was confirmed in 8 elements. The coefficients of the paths drawn in the above model are significant at the alpha level of 0.05. The fit indices of the final model for the 8 main elements are presented in table 3.

Table 3. Structural model fit indices

Indices	X^2	DF	P	X^2/DF	GFI	IFI	CFI	RMSEA	PCLOSC
Values	12.24	11	0.346	1.12	0.966	0.965	0.998	0.03	0.552

In accordance with Table 3, the values acquired for the GFI, IFI, and CFI indices are recorded as 0.966, 0.965, and 0.998, respectively, thereby indicating an exceptional fit. Furthermore, the RMSEA value is noted to be 0.03, while the PCLOSC index, with a value of 0.552, demonstrates a lack of significance. Overall, the values derived from the analysis of the structural model of the elements signify an optimal fit of the model.

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Discussion

The curriculum constitutes a critical component within the educational system, exerting a substantial influence on the overall quality of education, while also playing a pivotal role in achieving the quantitative and qualitative objectives and missions inherent to the educational framework. The curriculum is instrumental in determining the efficacy of the educational system, as it serves as a comprehensive reflection of educational quality and illustrates the responsiveness of educational institutions to societal needs. In light of this, the curriculum, as the vital essence of education, endeavors to realize the exalted aspirations of the educational domain. Neglecting to adopt a curriculum model that is congruent with the educational system represents a significant factor contributing to the educational shortcomings prevalent in society. Consequently, it is imperative to devise dynamic models that will facilitate the sustaining of knowledge, research, and developmental functions of the educational circuits.

The formulation of a curriculum model that disregards the perspectives of the stakeholders involved and overlooks the cultural, social, and religious contexts of the nation results in a model that fails to align with the needs, efficiency, and effectiveness of the educational system. Curriculum developers must remain cognizant of contextual conditions and relevant coordinates. Furthermore, the introduction of a new curriculum model should be harmonized with the overarching strategic objectives of the educational system. In this regard, modeling and adapting the educational frameworks of other nations may undermine the educational excellence of the country. Therefore, it is essential for researchers to undertake efforts to develop appropriate models that align with the specific requisites of the nation.

The curriculum model requires an all-encompassing and coherent framework. This framework should be meticulously devised and compiled to encompass various facets of the curriculum process, delineate the distinct components of the curriculum, and elucidate the significance and contributions of each element. This research endeavor aimed to identify the elements and components integral to the curriculum, and to propose a comprehensive model for the curriculum of the second year within the secondary education system. Based on the findings derived from the evaluation of the proposed model, "the design of the heutagogy curriculum model for the second year of secondary school in Tehran" is regarded as the foundational pillar for the actualization of the heutagogy curriculum model tailored for second-year high school students.

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These elements and their respective components are as follows: flexibility (the cultivation of a flexible mindset, the enhancement of cognitive capabilities, the implementation of non-linear planning, the embrace of diversity in planning, adaptability in program execution, an open disposition within the educational system, flexibility in classroom management, and the generation of knowledge within the educational environment); Goal (the meticulous consideration of advancements in goal formulation, goal setting with regard to uncertain future scenarios, the establishment of innovative educational frameworks, holistic goal setting, distinctive goal establishment, the articulation of learning objectives, methodologies for learning, collective thinking in goal formulation, and the incorporation of new insights in goal setting); Content (the diversity of educational material, scholarly investigation of content, exploration beyond conventional texts, collaborative content creation between educators and learners, the production of learning material, collective content generation, methodologies for producing educational content, oversight of content creation, practical content applications, specialized content focusing on writing skills, content derived from internship experiences, content that stimulates learning dialogues, the capacity to operationalize educational material, content pertaining to life and social skills, content related to communication and cultural competencies, and content addressing professional skills); Learner (the selection of learners, the inquisitive learner, the investigative learner, the strategic learner, cooperative learning, collective creativity, teamwork activities, self-directed development, the design of learning experiences, the uniqueness of each learner, non-linear educational approaches, profound learning experiences, skill application, intrinsic motivation to learn, and the practical application of acquired knowledge); Facilitation (constructivist classrooms, intellectually stimulating environments, interactive classrooms, facilitative competencies, proficiency in a variety of pedagogical methods, technological skills for educational purposes, social competencies, the educator's ability to learn, critical thinking abilities of the educator, systemic thinking by the educator, observational practices in authentic settings, practical engagement within the classroom, discussions regarding the learner's produced content, opportunities for self-determination, encouragement of creativity, the instigation of academic discourse, fostering deep understanding, the cultivation of intrinsic motivation, the establishment of a collaborative atmosphere, attention to areas of potential growth, instruction in problem-solving, guidance for students, and teaching skills related to learning design); Educational

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technology (digital forms of learning, digital modalities of teaching, digital libraries, the design and production of digital content, learners trained in educational technology, educational tools related to Web 2.0, cloud computing technologies, mobile learning technologies, interactive learning facilitated through media, expansive learning communities, the integration of social media into curricula, media mediation that strengthens systemic thinking, the anticipation of future trends, comprehension of complexities, learning to discern relationships among phenomena, the acquisition of critical analytical and interpretative skills, thoughtful inquiry, collaborative thinking, evaluation methods (flexible assessment, negotiated assessment, authentic assessment, continuous assessment, dialectical assessment, peer assessment, social assessment, action-oriented evaluation, parental assessment, program evaluation, provision of feedback, diverse evaluations aligned with objectives, ongoing self-assessment by students, learning derived from errors, metacognitive strategies in evaluation, student involvement in assessment, educator autonomy, learner independence, and assessment contracts), the logo meticulously designed and validated in the current research encompassing 8 elements and 109 components, while being comprehensive and demonstrating a robust alignment, intersects with and corresponds to the findings of other research studies both domestically and internationally.

The curriculum embodies a complex and multidimensional concept. In light of this, a multifaceted approach to the curriculum is evident within the presented model; such that the various dimensions pertinent to the heutagogy curriculum for second-year secondary education students have been calculated with a comprehensive perspective and an inductive methodology.

In this scholarly model, through the meticulous examination of the various components and elements of the curriculum, a comprehensive framework has been achieved for a profound understanding of the curriculum concept, which may assist stakeholders engaged in educational matters. In this context, it is imperative to accord equal and balanced attention to all factors, ensuring that no aspect is assessed in isolation or prioritized over others. Furthermore, the inclusion of educational personnel, instructors, and other stakeholders in the educational and training process is earnestly solicited. In contemporary times, the curriculum, regarded as a specialized domain, stands as one of the most crucial components in the professional advancement of the nation's human resources. Hence, within the educational framework of the nation, the establishment of dynamic and organic communication among the elements and components discovered, alongside

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a complex and multi-faceted perspective on the curriculum, shall facilitate the manifestation of positive outcomes and the emergence of impactful developments in the value-creating quality of education.

The findings derived from this research possess applicability at both micro and macro levels. At the macro level, entities such as the Ministries of Science, Research and Technology, the Supreme Council of the Cultural Revolution, and the Higher Education Research and Planning Institute may derive benefits from these results. At the micro level, the findings also hold significance for the governance of the nation. Additionally, as a reference point, it can address the research inquiries of scholars and those with an interest in the field of curriculum within higher education. Based on the insights and conclusions drawn from this research, the following recommendations are proposed:

1. In this investigation, a heutagogy curriculum model was devised and validated specifically for second-year high school students. It is advisable for the education sector to formulate and validate its own curriculum model in alignment with its indigenous and local objectives.

2. In the current study, eight principal elements pertinent to the heutagogy curriculum were delineated for second-year high school students. It is recommended to conduct an examination and analysis of each identified component of the curriculum in a detailed manner through case studies.

3. A comparative analysis should be undertaken to assess the model introduced in this research against the curriculum models of other nations worldwide.

4. Concerning the advancement of a culture of comprehensive participation among educational stakeholders, particularly teachers, it is essential to undertake effective measures. Enhancing the role of teachers can liberate the curriculum from biases, centralization, and elitist planning, thereby fostering endogenous movements in the realm of educational quality.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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