Providing a model to promote citizens' water literacy for sustainable development

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تدوین مدل ارتقای سواد آبی شهروندان به‌منظور توسعه پایدار

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Abstract

The aim of this study is to provide a model for promoting citizens' water literacy for a sustainable media-based development. According to the purpose of this research, it is an applied and exploratory type that has been obtained by the method of Strauss and Corbin's systematic method of data foundation theory. Due to the qualitative approach of the research, in-depth and semi-structured interviews were conducted with 34 experts in the fields of environment, water, social sciences and communications using theoretical sampling .Then the data were analyzed and 1120 primary codes of open coding, 71 categories of axial coding and 23 main factors of selective coding were identified. The main contribution of this research is the promotion of water literacy, which have been formed according to the causal conditions (targeting and policy-making in water literacy, water valuation, water attitudes, water skills, water knowledge, literacy promotion), the underlying factors (media diversity) as well as the intervening factors (media politicization, journalists' dependence on sources of power), which was obtained through the strategies such as change in educational system, pathology of educational master plans, interaction of industry, educational institutions and universities, promotion of social capital, interaction with media, audience, media greening, complete and rich media content, institutionalization of water discourse, agile media interaction . In the second stage, in order to weigh the causal conditions and strategies, hierarchical analysis was used. The results revealed that among the causal conditions, targeting and policy-making were the most important priorities in water literacy.

Keywords: Sustainable Development Training, Environmental Education, Greenwashing, Water literacy, Media.

چکیده

پژوهش حاضر با هدف تدوین مدل ارتقای سواد آبی شهروندان به منظور توسعه پایدار مبتنی بر رسانه انجام گرفته است. بر حسب هدف این پژوهش کاربردی و از نوع اکتشافی است که با روش نظریه داده بنیاد، رویکرد سیستماتیک استراوس و کوربین حاصل شده است. به سبب رویکرد کیفی پژوهش ابتدا با استفاده از نمونه‌گیری نظری با ۳۴ نفر از کارشناسان حوزه‌های محیط‌زیست، آب، علوم اجتماعی و ارتباطات مصاحبهٔ عمیق و نیمه ساختاریافته به‌عمل آمد. سپس داده‌ها تحلیل و ۱۱۲۰ کد اولیه از کدگذاری باز، ۷۱ مقوله از کدگذاری محوری و ۲۳ عامل اصلی از کدگذاری انتخابی، شناسایی شدند. پدیده اصلی این پژوهش، ارتقای سواد آبی در نظر گرفته شده که با توجه به شرایط علی (هدف‌گذاری و سیاست‌گذاری در سواد آب، ارزش‌گذاری آب، نگرش‌های آبی، مهارت‌های آبی، دانش آب، ارتقاء سواد)، عامل زمینه‌ای (تنوع رسانه‌ای) و عوامل مداخله‌گر (سیاسی شدن رسانه‌ها، وابستگی خبرنگاران به منابع قدرت) شکل گرفته است و از طریق راهبردهای (تغییر در سیستم آموزشی، آسیب شناسی طرح‌های کلان آموزشی، تعامل صنعت، نهادهای آموزشی و دانشگاه، ارتقاء سرمایه اجتماعی، تعامل با رسانه‌ها، مخاطب شناسی، سبز شدن رسانه‌ها، محتوای کامل و غنی رسانه‌ای، نهادینه‌سازی گفتمان آب) به‌دست آمده است؛ در مرحله دوم به منظور وزن‌دهی به شرایط علی و راهبردها از تحلیل سلسله مراتبی استفاده شد که هدف‌گذاری و سیاست‌گذاری در سواد آب مهم‌ترین اولویت را در بین شرایط علی را به‌دست آورد.

واژه‌های کلیدی: آموزش توسعه پایدار، آموزش محیط‌زیست، سبز شویی، سواد آب، رسانه.

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Introduction

The United Nations has declared 2005-2014 the Decade of Education for Sustainable Development, which inherently accentuates that sustainable education for sustainable societies is achieved through proper education. The idea of sustainable development arose from environmental concerns and critiques of economic and industrial development, and its goal is to conserve resources for all generations alongside meeting the needs of the current generation (Ghafari et al., 2016). Global commitment to environmental protection is tied to education, and school-based environmental education has emerged as the most traditional approach to knowledge transfer, focusing on the view of technocratic anthropology many years ago. But human-centered views, by placing man at the center of the universe, when they seek to protect the environment, see the centrality of the argument in proving the need for safeguards as merely in the interest of man (Rakei & Naeemi, 2016)، Whereas in newer perspectives, environmental education is a lifelong multidisciplinary approach to learning that leads to a greater understanding of the components of the environment, their relationships, and the impact of human activities on the environment (Oryan et al., 2019). In other words, environmental education seeks to change attitudes and behaviors towards the environment (Shobeiri et al., 2020). The goal of all training activities is to develop people's skills. Sternberg identifies five key factors involved in this interaction: cognitive skills, learning skills, thinking skills, information, and motivation (Meiboudi et al., 2016). On the other hand, the United Nations considers the ultimate goal of environmental education to be sustainable development (Kaviani & Nasr, 2018). If sustainable development is transferred to the mental framework of individuals, people will become literate in the sustainable development literature. In other words, environmental literacy and education about it can be one of the goals of sustainable development. Coppola acknowledges that in order for environmental literacy to increase, people's ability to see and hear must be developed (1999, Coppola). This method requires a complete change in the way a person conceptualizes the world around him and allows the learner to make informed decisions ; Instead of telling learners how to behave in order to be more environmentally friendly, environmental literacy focuses on the skills of thought, critical thinking, and informed decision-making because, as Standish argues, people may instead be environmentally literate fall into the trap of green washing (Wood,2014). With increasing environmental problems as well as public awareness about it, many companies, industries and owners of capital showed enthusiasm for environmental issues and turned to the production of environmentally friendly products (Guo,2014). Nielsen Media research shows that not only 66% of consumers in the world are willing to pay more for environmentally friendly products, but when they realize the corporate social responsibility for the environment, they may be more inclined to buy their products, even if they have a higher price (Grimmer & Bingham, 2013). In other words, the growing demand of companies for sustainable development led them to green marketing strategies to present a satisfactory image of themselves to consumers (Zhang et al., 2018). Thus, with the increase of green marketing and green trade, *Greenwashing* was created. Historically, the term was first coined in 1986 by environmental activist Jay Westervelt when hotels asked guests to reuse used towels, claiming it was a water-saving strategy, although no major environmental action was taken on the environment (Burbano & Delmas, 2011). This phenomenon refers to a company's dual behavior, namely poor environmental performance and positive theatrical communication about the environment. When there is a high level of inherent uncertainty about an issue such as the environment or water, conscious decision making can lead to change and stability (Wals, 2010). There are few resources in the field of water literacy. Due to the small number of academic works on water literacy, a single definition of the term is not available; however, the concept of water literacy has mainly an environmental concept. Roth first introduced the concept of environmental literacy in the field of environmental education in 1968, and Ewing and Mills introduced the concept of water

literacy in 1994 and used it to mean water knowledge, thus water literacy is mainly a derivative concept which embraces environmental literacy (Febriani, 2017). Amarasinghe and Sharma define water literacy as training and awareness of the efficient use of limited water resources. In order for people to be active in water consumption, there is a need for soft measures in water demand management, one of the most important of which is education. The successful experience of leading countries in environmental issues and education also confirms the important fact that different approaches to environmental problems and participation in solving them are all capabilities that can only be achieved through efficient education (Seifenaraghi et al., 2020). Moreover, water literacy, its creation and expansion in society is an ongoing education that can be done at all ages (Rcuk, 2009). In a country like Iran with little urban history and experience of authoritarian urban management, it is unreasonable and unrealistic to expect citizens to participate in the management of city affairs regardless of their education (Kiyani & Salari, 2017). In social learning theory, Albert Bandura shows how we learn and model from direct experience and observation. But since many of us are limited in terms of what we can see in our daily lives, much of what we learn is through the mass media. International conferences may raise environmental issues among the world's political elites, but it is the mass media that inform the public about scientific findings related to vital issues that may affect their lives (Castells, 2017). On the other hand, not only how much people are aware of and care about environmental issues and their consequences depends on media information, but also it depends on the type and extent of information received from the media which largely determines how people react to these environmental issues. In other words, Keating believes that the media are the primary sources of environmental information for many people (Mosavi, 2019). Given the need to institutionalize water literacy on a practical and theoretical basis and the lack of a coherent study of how to create and promote water literacy among citizens in Iran, this study intends to focus on the intertwined link between the media and teaching a model to promote the

BLUE (Biodiversity Literacy in Undergraduate Education) to media-based citizens. In order to further investigate and analyze the subject in detail, the domestic and foreign literature of the study was studied. None of the domestic studies have addressed this issue, and foreign research has focused more on measuring water literacy, and there has been no research that has developed a model for improving water literacy. For example, Hui-Shuang He (2018) in a study on "Identification of water literacy indicators (a case study in four regions of China)" has studied and measured the level of water literacy by creating three primary level indicators (water knowledge, water attitude and water behavior),besides 10 secondary level indicators and 27 tertiary level indicators of water literacy. He used a hierarchical analysis process to weigh the indicators and design a questionnaire that assessed water literacy in four geographical regions of China on a Likert scale. The results showed that water knowledge, water attitude and water behavior of participants in different regions vary according to their level of economic development. However, water literacy scores were low in all areas. So Hui-Shuang He concluded that there is still a long way to go to improve water literacy in China (Hui-Shuang, 2018). Febriani (2017) in a study on "Water literacy survey in developing countries (case study of Indonesia)" measured the water literacy of middle-income people online by survey method. The most important results of this study were: 1) The average score of water literacy among women was lower than the group of men 2) The average score of all respondents showed a low level of water literacy 3) The results of the study also confirmed the need for more education at the household level. Another study in the UK, by Wood (2014) on "Water literacy and citizens: water education for sustainable development" explored water use among young people through exploratory studies and questionnaires, and the findings showed that innovative creative education programs could raise the standard level of water literacy in the UK that naturally needed to reinforce the sense among young people that they were responsible for water resources and that their personal actions could be effective at the local, national and global levels. Therefore, considering the

increasing problems caused by climate conditions and water challenges in Iran and also the strategic nature of the water crisis in the society, according to what has been said, designing a model to improve citizens' water literacy can internalize the value of water among the citizens and ultimately help preserve the environment. For this purpose, in order to achieve the purpose of the research, three basic questions were posed as follows: 1- What are the factors and conditions that promote citizens' water literacy? 2- What is the optimal model for promoting citizens' water literacy? 3- In general, what are the strategies to promote citizens' water literacy?

Research Methodology

This study is applied in terms of purpose and in the category of exploratory research by Mix Method (qualitative-quantitative). Due to the exploratory nature of the research, first the qualitative research approach was selected as the appropriate approach and due to the need for in-depth knowledge of the subject, the study of Grounded Theory or data theory of the foundation was considered as a research method. In 1994, Strauss and Corbin explained grounded theory as follows: "Grounded theory is a general research method for generating theory. This theory is derived from data that has been systematically collected and analyzed during the research process. In this strategy, data collection and analysis and the theory that is ultimately deduced from the data are closely related. Instead of beginning his study with a preconceived theory, the researcher begins with a specific field of study, allowing the theory to emerge through data. A theory derived from data is more likely to represent reality than a theory that results from the aggregation of a series of concepts based on experience or reflection, and because theories are inferred from data, they can be reliable guidelines for action by providing insight and deeper perception. (Mansourian, 2007). In other words, Grounded Theory is the process of constructing a codified theory through organized data collection and inductive data analysis to answer new questions of those qualitative researches that lack sufficient theoretical foundations in the field of study.

This theory broadly describes a process, action, or interaction. In this way, research never begins with a theory and then proves it, but the research begins with a period of study and is given the opportunity to show what is relevant (Bazargan, 2007). Accordingly, the research was first conducted using data-driven theory, because the dimensions and factors affecting the promotion of citizens' water literacy based on the media, its causes and strategies are not clear. The statistical population of the study consisted of all specialists and experts in communications, culture and the media, water and environment experts, sociologists including professors, managers of water resources management and experts in this field - in Iran - who were sampled because of their extension and inaccessibility. The most appropriate method of sample selection for this research was first identified theoretical sampling, which is the process of data collection for theorizing, through which the analyst simultaneously collects, encodes and analyzes his data and he decides what data to collect in the next step and where to find it in order to formulate his theory. The theory under development controls the data collection process (Flick, 2007). Foundation Data Theory uses theoretical sampling to maximize opportunities to compare events, happenings, or happenings to determine how to change a category based on its characteristics and dimensions. Then, purposeful Snowball Sampling was used. In purposeful sampling, the researcher's goal is to select samples that have a lot of information about the research topic (Sarmad et al., 2014). In this regard, after an initial group selected by the researcher, the rest of the experts were introduced by experts. In this study, the sample size continued until theoretical saturation was reached. Theoretical saturation means that conducting new interviews does not add any data to the previous categories or alter the relationships between them. Data saturation was observed in 30 interviews, but continued for up to 34 people for more assurance and confirmation of the findings. In other words, the tool of this research was an in-depth and semi-structured interview, which was narrated (Silverman, 2005). The questions in this type of interview

are open and general; that is, they are not prepared in advance, and the interview process largely relies on questions that arise spontaneously in the interaction between the interviewer and the interviewee. Due to the prevalence of Coronavirus disease 2019, these interviews were often online and lasted an average of 60 minutes, which lasted a total of 8 months with prior appointment and coordination. To increase the accuracy of the data analysis, all interviews were recorded, and then each interview was typed separately and the researcher wrote down the concepts that came to mind and then coded and then analyzed. This step is the first step in data analysis in Grounded Theory called Coding. For Open Coding, the text of the interviews was read several times and the main concepts were extracted and recorded as code, and then similar codes were placed in categories. In Axial Coding, classes were linked to their axial classes to provide more accurate and complete explanations of the phenomenon. Also in Axial Coding, the primary categories formed in Open Coding were compared and those that were similar were centered around the common axis. Finally, in the Selective Coding, the categories were integrated and refined, and one category was selected as the central category and the model was presented based on the central category axis. In other words, the key points of the data were discovered by conducting interviews and through various types of coding (open, axial and selective). In this way, a code was assigned to each point, the codes were constantly compared, and those codes that indicated a common aspect were called category concepts. Concepts, then, are words that refer to groups or classes of events, objects, and actions that share common characteristics. Finally, after discovering the codes, a model was presented through which the reasons for promoting citizens' water literacy were identified, which can be used to help improve citizens' water literacy by using strategies. In this research, in the Open Coding stage, 1120 concepts were obtained and then in the Axial Coding, 71 categories were classified in causal, intervening, strategy, contextual and consequences conditions, and in the third level, 23 concepts were obtained in the Selective Coding. Validation of categories and their network of relationships and their integration is the most important part of research activity in Grounded Theory. Three common criteria are: Data must be reliable and valid; the researcher should explain the process of his / her research activities in such a way as to find out with what evidence and how he /she has reached the conclusion of the main category and other categories, and the researcher should satisfactorily explain the regular relationship between the categories and their integration and how to explore the semantic network and its theoretical model and its compatibility with the social world under study (Ferasatkhah, 2016). Additionally, research reliability consists of four criteria:

1- Validity: It is a qualitative alternative to the internal validity criterion. It is about matching the facts that the participants want with the facts presented by the researcher. In order to achieve this, the researcher personally evaluated the interviews conducted several times and then returned his / her interpretations of the 5 interviews to the interviewees themselves and received their feedback that the results of the interpretations were generally accepted by the interviewees. However, very minor corrections were made to them. 2- Transferability: is equivalent to the concept of external validity in quantitative research. It refers to the degree of generalizability or transferability of qualitative research results to other fields and environments. The prevailing conditions regarding water status, water literacy, and the opinions of experts in the fields of water, communications, culture, media, and sociology are so tangible that the reader can assess the transferability of the findings to other similar situations. 3- Reliability: It replaces the concept of reliability in quantitative research. To increase reliability, it is recommended that the researcher pay attention to the changing conditions of the research design, changes in the phenomena under study and in general to the changing context of the research and describe these changes in detail. During the interviews, participants shared their current and past experiences on water literacy. As a result, their experiences were realized regardless of the time of occurrence. 4- Verifiability: Equivalent to the concept of objectivity in quantitative research. Are the data and findings verifiable by others or not? The verification criterion in qualitative research ensures that

data, interpretations, and results can be traced to their sources (Hariri, 2011). To achieve this goal, the researcher provided a general summary of the formulated model separately to 5 professors of sociology, culture and media, and their opinions were taken to correct and modify. Also, at the end, the model was seen by some professors and interviewees and corrections were made on it. In addition to the above, the following were also considered to assess the validity and reliability of qualitative research: 1- Generality: The extent to which the findings show the different dimensions of the phenomenon under study. 34 - in-depth interviews were conducted with experts in each field and repeated review of questions in order to achieve this. 2- Truth: The extent to which the interpretations are not affected by incorrect information or evasion of the interviewees. All interviews were conducted professionally and in a friendly atmosphere, at the discretion of the interviewees and away from any pressure, and no evidence was found that the interviewee was trying to evade the topics under discussion. 3- Adaptation: The extent to which the findings are consistent with the mental structure of individuals relative to the phenomenon under study. This was achieved through the methods used to achieve reliability, reliability and verification. 4. Comprehensibility: The extent to which the research results represent the extent to which they represent the real world of the interviewees. For this purpose, the research findings were provided to 5 interviewees and were understandable for all of them (Flint et al., 2002). In other words, in this study, in order to evaluate the validity of the method of "research team triangulation", "long-term engagement and continuous observation", "selection of appropriate samples", "simultaneous data collection and analysis" and "review of participants" were used. The research team triangulation consists of three items: data consensus, researcher consensus, and method consensus. In this study, more than one observer, interviewer, and analyst were participated to try to reduce the potential bias in data collection, reporting, and coding, beside the necessary data analysis that should be used as well as various interviews which were conducted with experts in this regard. In the

second stage, the hierarchical analysis process was used in order to weight the causal conditions indicators and the strategies obtained, by using Expert Choice software, pairwise comparison and the incompatibility rates. The statistical population in the quantitative section was 12 water and communication specialists who were selected by Snowball sampling.

Research Findings

A- Research findings in the qualitative section
Causal conditions for promoting media literacy of citizens based on the media

Causal conditions are events and happenings that lead to the occurrence or development of a phenomenon. A phenomenon is the idea, incident, event, and main event that a set of actions or interactions are directed to manage or a set of actions are related to it. Among the concepts and categories extracted in this research, 425 Open Codes, 16 concepts in 6 categories were considered as part of the conditions for promoting citizens' water literacy and they can be seen in Table (1).

For example, the following were narrations related to policy factors and goals in water literacy:

"When we talk about water literacy, we should first of all look at the literacy of a product and not a group, but a group of people who are influential in this field; see the role of consumers, producers, government agencies, policymakers. Public knowledge and awareness of the issue of water should be raised through the media. The audience should know that water is a limited resource."

"Water literacy is poor among people in terms of basic concepts. Water resources are scattered in Iran and people do not know it. The water in the Zagros has nothing to do with the water poverty of Sistan and Baluchestan. Water news and information have become nationally integrated, when it is said that the rainfall reached 216 mm in the country, it is not comparable to the rainfall in Yazd, which is 40 mm. In the discussion of water base, not only the public but also water reporters are not justified. To expand water education according to water resources in different areas, regional

water literacy should be implemented.Work should be done on culture and education."

"In order to create new science and literacy by journalists, including water literacy, it is necessary to combine dead science, which is simply the transfer of data and information from teacher to student, with living science, which is a gradual process of circulating phenomena and ideas in scientific communities. The result of dialogue and coherent scientific communication is to replace; we must maintain and use the persistence of the sensitivity that has arisen in the society towards water until it leads to a behavior and eventually to a change in behavior. We should be hopeful, but it seems that we have a long way to go in the process of changing behavior, and there is still a long way to go to reach a point where we can say that the water literacy of the society has improved and reached the level that the country's water resources management counts on. The behavior of citizens should be responsible, committed, forward-looking and national."

Axial Phenomenon

The central or main phenomenon always appears in the data and all other main categories are related to it. In this research, the main phenomenon was the promotion of citizens' water literacy.

Table 1. The causal conditions of promoting citizens' water literacy

Axial coding	Selective coding	Dimension	Conditions
Efficient management Correcting past misguided water policies Reforming the one-sided view and governmental nature of the water issue in the country Avoid abstract and general talk about water literacy Targeting and planning in water literacy Using the role of elites in the water behavior of citizens	Targeting and policy-making in water literacy	Managerial	Causal
Internal valuation of water External valuation of water	Water valuation	Social	Causal
Water beliefs The role of religion and ethics in water consumption	Water attitudes	Social	Causal
Investigating water consumption behaviors	skills Water	Social	Causal
Understanding the basic concepts of water Understanding the concept of virtual water Understanding the concept of water footprint	Water knowledge	Scientific	Causal
Correction of superficiality of society literacy The effect of promoting environmental literacy on water literacy	Literacy promotion	Educational	Causal

Intervening factors affecting the promotion of water literacy of citizens based on media

Intervening conditions are general conditions from which strategies are affected. Intervening conditions are structures that facilitate or limit the intervention of other factors. Among the concepts and categories extracted in this study, 117 open sources, 6 concepts in 2 categories were considered as intervening conditions, which were significant in Table (2).

For example, one of the narrations related to the concept of journalists' dependence on sources of power was as follows:

"The unconventional communication of some government officials in the water sector with some journalists is very effective in the discussion of journalism. They sometimes interfere in the published material by threatening or bribing journalists and sometimes the news does not even reach the publishing stage and the reporter with previous experience does not go to those challenging topics. In some cases, the journalist even censors himself and deletes the content."

Table 2. Intervention conditions of promoting citizens' water literacy

Axial coding	Selective coding	Dimension	Conditions
The role and influence of the government on the mainstream media Politicians' intervention in the media	The politicization of the media	Political	Intervener
Threatening reporters Getting water news sources from journalists by politicians Luring water reporters Lack of independence of the journalists as well as the media from information	Dependence of journalists to power sources	Social	Intervener

Contextual factors affecting the promotion of water literacy of citizens based on the media

Contextual factors refer to a set of specific features of a phenomenon. In other words, these categories represent a chain of environmental conditions that affect strategies. Among the concepts and categories extracted in this study, 87 Open codes, 2 concepts in 1 category were considered as part of the contextual conditions that the effective contextual factors were identified in Table (3).

For example, one of the narrations related to media diversity was as follows:

"I believe that the influence and even the task of different media in meeting the needs of the audience is not the same. Newspapers are news media that can be effective in various dimensions and can provide the necessary information for their specific audience by providing accurate and precise information. On the other hand, the ability to present views and attitudes that are constantly changing and reviewed on social networks, will have a great impact on creating new attitudes and creating public interest and participation in this field.

Table 3. Contextual conditions of promoting citizens' water literacy

Axial coding	Selective coding	Dimension	Conditions
The role of media diversity and media diversity The role of new and traditional media	Media diversity	Media	Contextual

Effective strategies in the model of promoting citizens' water literacy

In a context and with specific intervening conditions, a specific set of possible strategies or actions is presented that includes strategies for controlling and managing the central phenomenon. In this study, 358 open sources, 36 concepts in 10 categories were identified, which were presented in Table (4).

For example, one of the narrations related to agile media interaction was as follows:

"Flexibility In choosing the type of medium should be regarded, we can not say more educated than the medium and the mother, for example, the newspaper should start; people are consuming the media, and we have to be guerrillas for faster access and to be seen by the majority, we have to find different genres."

Table 4. Strategies of promoting citizens' water literacy

Axial coding	Selective coding	Dimension	Strategies
Replacing the educational system Transformation in the current education system Use both formal and informal training Paying attention to individual interests in education The need for changes in the content of educational books Avoiding the quantitative educational system	Changes in the educational system	Educational	Strategies
Paying attention to feedback Pathology of Danab educational plan	Pathology of educational master plans	Educational	Strategies

Pathology and why not use the capacity of media professionals			
supporting water industry of new academic findings on water literacy	Interaction of industry, educational institutions and universities	Educational	Strategies
Concerns about water by people The need for convergence and the use of collective wisdom in the water issue Stakeholder participation in water management Building trust	Promotion of social capital	Social	Strategies
Using the capacity of various media in water literacy training Water valuation through media The role of experts and intellectual leaders in the transfer of water literacy The university approaches the issue of water and engages with it and communicates with the media	Interact with the media	Media	Strategies
Separation and typology of audiences	Typology of water audience	Audience	Strategies
Highlighting the water crisis in the media The entry of water experts into the media space	The greening of the media	Media	Strategies
Observing rationality in media content The importance of critical thinking in the media content Flexible, future-oriented and predictive content Research and analytical approach in the media content Indigenous, local, regional and international downloads in the media content Using of added senses Metadata and the use of multimedia capabilities Initiative and creativity in the media content	Rich and complete media content	Media	Strategies
Capacity building of water dialogue through non-governmental organizations Promoting water literacy of officials Promoting environmental literacy Convergence of theoretical and practical literacy in water literacy Utilizing the capacity of citizen journalism and citizen amateur journalists	Institutionalization of water discourse	Social	Strategies
Timely publication of the media content Fast message transfer in the media	Agile media interaction	Media	Strategies

Positive Consequences of Using Strategies and Negative Consequences of Not Using Strategies to Promote Citizens' Water Literacy

Some categories represent the results and consequences that result from the adoption of strategies. Consequences are the outputs or results of action and reaction. Among the concepts and categories extracted in this study, 133 open sources, 12 concepts in 5 categories were considered. The positive and negative consequences of using or not using were shown in Tables (5) and (6).

Table 5. Positive impacts of promoting citizens' water literacy

Axial coding	Selective coding	Dimension	Consequences
Paying attention to the next generation Environmental Protection Long-term effects of water literacy on people's lifestyles Improving the business environment and economic prosperity	Sustainable Development	Social	Consequences
Concerns in the audience about water issues The objective, multidimensional, short-term and medium-term effects on people's lives	Creation of water Citizenship	Social	Consequences

Table 6. The consequences of the lack of promoting citizens' water literacy

Axial coding	Selective coding	Dimension	Consequences
Deviation of citizens from water literacy Demonstrative actions in the field of water and environment	Greenwashing	Media	Consequences
Transforming the water crisis into a crisis of civilization Disruption in social order	Creating crises and disturbances	Social	Consequences
Increasing false information about water Dissemination of non-expert and technical opinions in the field of water by non-experts	Spreading the rumors	Social	Consequences

B- Research findings in the quantitative section

In the second stage, hierarchical analysis was used to weigh the causal conditions and strategies. Sub-criteria of targeting and policy-making in water literacy with a relative weight of 0.137 had the greatest importance and the greatest impact (Table 7). The incompatibility rate of pairwise comparisons was 0.08, which was less than 0.1, and the pairwise comparisons were acceptable. The sub-criterion of change in the educational system with a relative weight of 0.083 was the most important and had the most impact among the 10 sub-criteria (Table 8). The incompatibility rate of the pairwise comparisons was 0.07, which was less than 0.1, and the pairwise comparisons were acceptable.

Table 7. Prioritizing the following criteria for causative conditions

Row	Indicators	Weight	Priority
1	Targeting and policy-making in water literacy	0/137	1
2	Water valuation	0/062	5
3	Water attitudes	0/118	2
4	Water Skills	0/053	6
5	Water knowledge	0/088	3
6	Literacy promotion	0/071	4

Table 8. Prioritization of the strategies' sub criteria

Row	Indicators	Weight	Priority
1	Changes in the educational system	0/083	1
2	Pathology of educational master plans	0/032	9
3	Interaction of industry, educational institutions and universities	0/035	8
4	Promotion of social capital	0/068	2
5	Interact with the media	0/061	3
6	Typology of water audience	0/056	4
7	The greening of the media	0/040	7

8	Rich and complete media content	0/049	6
9	Institutionalization of water discourse	0/068	2
10	Agile media interaction	0/054	5

Considering the importance of promoting citizens' water literacy and the model gap for it, the following proposed model for citizens based on the desirable characteristics of the media elements was presented in Figure (1).
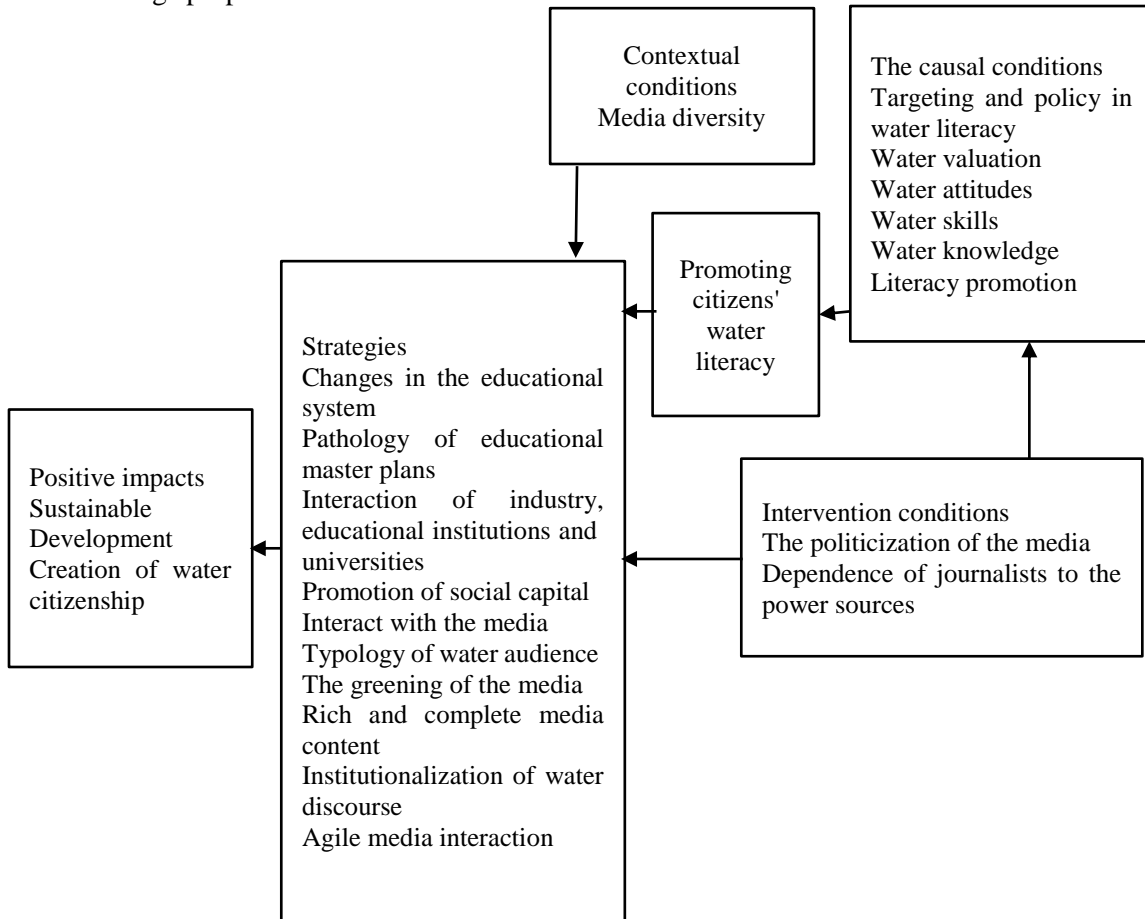

Fig 1. Citizens' Water Literacy Promotion Model

Conclusions and suggestions

Factors, humans and social aspects are the main causes of water crisis in our country, Iran; however, the water crisis is a crisis of security, politics, economy, society, culture and literally everything. Even the World Peace Institute has emphasized in its report on Iran's environmental performance index that the danger posed by the impending environmental crises in Iran far outweighs the dangers of foreign enemies and domestic political conflicts (Hemati & shobeiri, 2015). The impending catastrophe of the water crisis is expected if the water literacy of the citizens is not promoted and the role of the human factor is one of the main factors for adapting to water shortage and distancing oneself from water bankruptcy. Thus, this study was conducted with the aim of achieving a model for promoting citizens' water literacy for sustainable development using the Data Theory method. Based on the results, the causal conditions for promoting citizens' water literacy, goal-setting and policy-making in water literacy, water valuation, water attitudes, water skills, water knowledge and literacy promotion were obtained. According to the quantitative findings, targeting and policy-making in water literacy were the highest priorities. Adopting the right policies

on water issues in general and water literacy in particular is directly related to the understanding of the country's policymakers on these issues. Evidence suggests that the state of attention to environmental issues and water resources is changing among politicians and has become one of their priorities. In the documentaries of the presidential candidates in 1396, the issue of environment was one of the most important issues raised by the expert teams of the candidates who were part of each candidate's campaign (Ameli et al., 2019). According to the research findings, in the context of the media, diversity was recognized as the main category that was related to the profound impact of the media on people's attitudes and insights. Awareness of water issues was the basis for creating water behavior. Much of this awareness was influenced by the media; since they convey different kinds of information that people would not otherwise obtain (Giddens, 2017). Moreover, political affiliation of the media and the journalists' connection to the power sources, were obtained as the categories of intervention in this study. Accordingly, in addition to academic scientific work and water-related research, the mainstream media, news agencies, universities, public relations of water-related agencies such as the Ministry of Energy and Jihad Agriculture, Environmental Protection Organization and other relevant institutions should invest in educating the generation of independent journalists who publish water media messages scientifically and impartially. The research findings also suggested the promotion of citizens' water literacy by applying strategies with the priorities such as: changes in the education system, promotion of social capital, institutionalization of water discourse, interaction with the media, audience studies, agile media interaction, complete and rich media content, media greening, industry interaction, educational institutions and universities, and pathology of educational master plans. According to Castells, the media play a key role in publicizing the water issue; in other words, the greening of the media and their internal and external evaluation of the water issue, the creation and strengthening of

beliefs, and the water attitudes that occur at three levels: individual, institutional and social level,which ultimately leading to a change in water behavior and the formation of water citizens. Attitude, environmental knowledge and water literacy were also precursors to the water behavior. There was also a positive and direct relationship between the social capital and the environmental behaviors. That is, with the increase of social capital, the environmentally responsible behaviors of individuals also increase (Salehi & Emamgholi, 2012)That is, with the increase of social capital, the environmentally responsible behaviors of individuals also increased; in other words, behavior follows a chain of factors, and the loop that occurs before the behavior was the behavioral intent. In particular, trust was one of the precursors of the environmental behavior that was improving with the speed of the media action in covering water content or in the words of this research, "agile media interaction" along with the institutionalization of the water discourse, interaction with the media, audience, complete and rich media content, the greening of the media, the interaction of industry, educational institutions and universities. Good water governance required the participation of the people, and the greening of the media was assumed as a means to increase the participation of the people. Finally, the consequences of the implementation of water literacy promotion strategies for the citizens could cause not only sustainable development but also formation of water citizens. Consequences of not implementing the strategies also included greenwashing, spreading rumors, and creating crises and disturbances. The people of Iran live in an arid and semi-arid country that has always had difficulty in supplying water in some parts of the country; however, the behavior of Iranians is in contrary to thier history and to the past of Iran - as evidenced by research as well as social evidence - thus, their behavior is not consistent with the behavior of people living in a country with these special conditions; and hence, for a long time, the resources and their over-consumption in the country have not been

compatible. Of course, this discrepancy and low level of water literacy of citizens, were also demonstrated by Hui-Shuang He (2018) in his research in China, Febriani (2017) in his research in Indonesia and Wood (2014) in his research in the UK and these conditions arise from a set of economic, political, cultural, social and educational factors that need education through creative methods to promote water literacy of citizens, especially among young people. Further, improving citizens' water literacy can lead to the adaptation and coordination of people's behavior with the climatic conditions of a dry country like Iran, so that while the current generation meeting their rational needs, they could pay attention to the next generation. At the end, the following practical suggestions are presented: In order to study the level of water literacy of citizens, comprehensive studies should be done considering a set of economic, political, political, psychological and social factors, because most of the studies are now scattered, unidirectional and single-factored. In projects dedicated to raising public and private awareness about water-such as the National Student Water Rescue Project, Danab, which has been running in schools across the country for more than ten years, in addition to providing more value by related organizations like the Iranian Water Resources Management and Education Company, as well as the decision-making institutions- scientific pathology and plan should be considered to take the necessary basic steps. Given the institutional power of the media in general, in universities, formal and informal educational institutions, public relations of organizations dealing with water issues, media professionals, including content makers, journalists and journalists, all should be seriously trained on water literacy besides macro and strategic policies. This should be aligned with academic research in the interdisciplinary fields of communication sciences, social sciences and water technical topics; however, in order to improve the water literacy of citizens in the field of the media, we should pay attention to the following issues:

1. Empowering the media in water issues in order to provide accurate, sufficient and timely information to the citizens.

2. Creating formal and informal channels and networks of communication between water experts, sociologists and members of the media for the exchange of knowledge and water literacy with the aim of reducing the gap between elites, professionals and the people in order to build trust.

3. Integrating water literacy topics with other issues such as textbooks, radio and television programs, newspapers and public magazines in order to implement sustainable water education in the short and long term with the support of formal and informal educational institutions.

4. Paying serious attention to new communication media and interactive social networks in education, especially those media and networks that most young people are interested in.

5. Attracting special attention of the government officials to water literacy education at all ages, especially for the children and adolescents, and providing necessary infrastructure for its promotion.

6. Paying serious attention to new researches to achieve creative educational methods in schools and universities about water literacy.

7. Creating competition among the media to promote and expand water literacy through holding festivals, conferences and similar events.

8. Creating and designing water literacy software, as well as establishing water parks and permanent exhibitions of water literacy in real and virtual contexts.

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