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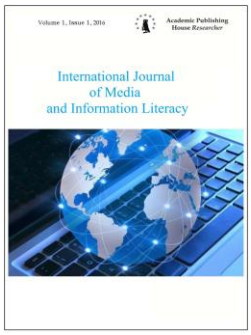

Cultivating the Skills of Systems Thinking in the Context of Fostering the Basic and Professional Competencies Associated with Media Education and Media Literacy

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Abstract

This paper examines some of the key mechanisms for cultivating the skills of systems thinking using methodologies such as the theory of inventive problem solving (TRIZ) and algorithms for solving problem situations (ARPS) in media education. The author puts forward a suggestion that the realities and needs of the present-day economy and its transition to the fifth and sixth technological paradigms will transcend traditional methods of education, bringing about change in approaches, methodologies, and objectives associated with the educational process, with a focus on replacing extensive forms and ways of teaching and learning with methods related to the intensive development of skills and professional competencies associated with media literacy and media education.

A key objective in this context is to cultivate and foster the skills of systems thinking, which implies a capacity for strategic planning and design and creative solving of non-routine problems and an ability to detect inconsistencies and interdependencies in media texts and media messages. In this context, the paper brings forward several tools for fostering the skills of systems thinking, which are as follows: case problems, systems thinking tests, and systems mapping.

The paper examines some of the key theoretical and applied aspects of the theory of inventive problem solving and algorithms for solving problem situations in the media sphere. The author's conclusion is that the TRIZ–ARPS methodology can be employed quite efficiently in fostering the basic and professional competencies associated with media literacy and media education.

Keywords: systems approach, systems thinking, TRIZ, ARPS, media literacy, media education, media context, media content, systems mapping.

1. Introduction

The transition of the global economy to the fifth and sixth technological paradigms is causing an exacerbation of the issue of "redundant people" – individuals who objectively cannot be employed anywhere within the real sector of the economy. The risk of being in this category may be posed to those in the employable population due to their lack of knowledge of the latest methods for operating complex systems, as well as low levels of motivation and being unprepared to be trained and retrained.

In nations characterized by permanent economic recessions and most of the population living below the poverty line, these individuals are objective potential sources of destructive social

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conflicts. The destructive nature of such conflicts is associated with the absence of a realistic program for sustainable development and a strategy for building social capital. In a climate like this, it appears to be advisable to focus on cultivating the sought-after skills of systems thinking, enhancing the level of media education and media literacy among the population, and fostering the skills of critical perception of information and interpretation and analysis of media texts (Silverblatt, 2018).

In this regard, there is a need to replace traditional approaches and models of education with those predicated upon the principles and values of development-focused pedagogy, focused on employing systems modeling and design, fostering cognitive abilities and media and information literacy, and cultivating emotional intelligence. An alternative to the traditional approach in teaching and training a workforce in a climate of changing social conditions is to shift to a strategy of sustainable development, with a focus on synchronizing the basic and professional competencies, abilities, and skills with the needs of the economy and the labor market, determining the growth points, and creating a multifocal system of administration.

2. Materials and methods

In conducting this study to explore a set of mechanisms and tools for cultivating the skills of systems thinking in the context of fostering the basic and professional competencies associated with media education and media literacy, the author employed the following key methodological tools: the theory of inventive problem solving (TRIZ), as a methodology for fostering the skills of systems thinking based on the principles of conscious, purposeful, and manageable thought processes; algorithms for solving problem situations (ARPS), which imply the availability of problem cases and situational problems for identifying contradictions, as a key factor for the development of a creative intellect.

3. Discussion

Media literacy is one of the key competencies nowadays. The rapid development of information and communications technology has brought about a number of issues regarding the way people become aware of, perceive, and reconceptualize information, which very often takes on the form of a manifestly manipulative narrative that can produce misleading discourses.

When people misunderstand or have a distorted idea of reality and are unable to assess objectively what is going on in society and certain forces are artificially creating conflict and stressful situations, this may give rise to the threat of reality getting dehumanized. Accordingly, in today's climate of information overload, there appears to be a need to cultivate and develop the cognitive skills of analytical, critical, and systems thinking and foster the skills of media hygiene.

Currently, the issue is not being given the attention it deserves. So far, the greatest success in the area of the development of media education has been achieved by commercial establishments, whilst government institutions, schools, and institutions of higher learning have acted only recently to incorporate programs on media education into the curriculum. For the most part, today it is mainly the teacher's initiative to employ practical cases in the educational process that is helping put into effect the principles and objectives of media education.

In an interview published in the journal 'Communication Today', media education experts A. Fedorov and D. Buckingham give a positive estimation of the prospects for media education and media literacy, which, in their view, will develop further as new technology and media emerge. On one hand, this will stimulate the emergence of independent sources of information. On the other hand, there will be exponential growth in the amount of information, which, in turn, suggests a need to cultivate the basic and professional skills of media literacy, taking into account factors such as cross-cultural and multi-cultural diversity (Vrabec, 2016).

The issue of media education and media literacy has been the subject of increasing research focus. It has mainly been explored in the context of scientific literacy and critical media education, which are gaining increasing relevance in today's climate of technologization and digitalization throughout society (Kendall, McDougall, 2012; Tisdell, 2008; Lee, 2018; Tully et al., 2020).

In this context, the cultivation of the skills of media literacy is of relevance for all age groups, with a focus on the use of outside-the-box, creative methods in media education. In particular, in the process of media-education of senior citizens, who more than any other section of the population are in need of this type of education, including the development of a range of

competencies and skills that are essential for working with information sources, using, creating, and critically analyzing media texts, and understanding how the latest technologies and media work, it may help to employ interactive methodologies and conduct creative workshops (Rivinen, 2020; Petranova, Vrabec, 2016).

No less relevant is the cultivation of media competencies through the various contexts of daily life and a "culture of participation", with a focus in media education on enhancing young people's level of civic engagement, engaging them in the area of social practices, fostering in them the skills of monitoring, control, and examination of the work of government institutions, inculcating in them the principles of equality and tolerance, and helping them get rid of various stereotypes and prejudices (Kahne, Bowyer, 2019; Weninger, 2018; Joanou, 2017; Erba et al., 2019; Cubbage et al., 2017; Sekarasih et al., 2018).

Researcher M. Dezuanni has analyzed the media-educational potential of the popular game Minecraft, which is believed to foster children's digital media literacy across the following four nodes: digital materials, media production, conceptual understanding, and media analysis (Dezuanni, 2018).

Thus, in this context, media literacy can be defined quite broadly – for instance, as a collection of skills and abilities that enable one to analyze, evaluate, and create a media product using the skills of systems, critical, and analytical thinking. In the view of D. Buckingham, media literacy is not a static phenomenon but implies a sort of dynamic set of skills and abilities that is determined by the situation in the markets and the special nature of the development of social relations. According to the scholar, fostering media literacy may involve the following: developing skills in handling technology; raising awareness of new marketing practices and enabling one to resist commercial persuasion; encouraging active citizenship and participation in civil society; promoting creative and artistic self-expression through the use of new media; delivering the subject curriculum in more exciting and relevant ways for "twenty-first century learners"; encouraging the development of a globally competitive media content industry; developing human capital for the emerging media and technology industries of the knowledge economy (Buckingham, 2009: 14-15).

4. Results

Based on the Coursera Global Skills Index and the Hays Global Skills Index, a map has been created for a set of core skills and competencies required in the areas of technology, business, and data science, which includes cultivating media literacy and developing the skills of critical and systems thinking, which are central in media education and are among the top 10 soft skills to be fostered in general and professional education (GSI Coursera, 2019; GSI Hays, 2020).

In this context, it is worth noting that in large part this trend is linked with changes in the very nature of labor in today's world and the intervention of artificial intelligence and Big Data in the area of professional employment, when it is no longer enough to just possess the hard skills needed to do the job and there is a need to also develop a set of soft skills, with a particular focus on developing one's ability to work in a team, developing one's leadership qualities, being adaptable and flexible in learning, developing one's cognitive abilities and emotional intelligence, and enhancing one's level of media and information literacy (Pate, 2020).

Lately, the need to develop soft skills has been emphasized by participants in the World Economic Forum in Davos, which is a platform for shaping the future of the new economy and society. Of particular importance are a combination of "digital" and "human" factors in the new economy, the increased role of communicative, managerial, creative, and leadership skills, the ability to analyze and critically conceptualize information, and the capacity for systems-structural thinking (Jobs of Tomorrow Mapping, 2020).

In this context, the author recently conducted a study aimed at assessing student youth's level of media literacy and investigating how they perceive and assess the latest global trends in the media sphere. The study engaged first-to-fourth-year university students taking the integrated course 'Democracy: From Theory to Practice', which incorporated a special module on media education. It was conducted by way of surveys in Google Forms and group chats in the Telegram messaging application. The average age of the participants was 19 years. There were a total of 329 respondents.

The answers to the questions in the questionnaire confirmed the trend of a shift of attention from the area of the verbal to the area of the visual, based on the principles whereof models for

managing both mass and individual consciousness tend to be created. To the question about the amount of time they normally spend surfing the Internet, most of the survey participants responded by saying it was no less than three hours a day, with 52.6% of the respondents focused primarily on looking for and consuming entertainment-related content. At the same time, 63.2% of the respondents confessed to spending less than one hour of their time on educational content. It is obvious that there is a decline in youth's interest in educational content, compared with its entertainment-related counterpart.

Table 1. Respondents' Level of Online Activity

	1 hours, %	3 hours, %	5 hours, %	Over 5 hours, %
How much time a day do you spend looking for/consuming entertainment-related content on the Internet?	28.9	52.6	15.8	2.6
How much time a day do you spend looking for/consuming educational content on the Internet?	63.2	31.6	5.3	0

As for social networks, about 63 % of the respondents said they spent quite a lot of time (3–5 hours a day) communicating or consuming some kind of content over such networks. That said, just 29 % were found to be active users of social networks (i.e. those who produce content of their own), whereas 71 % were found to be passive consumers of someone else's media product.

Of particular interest are the study's findings on the degree to which the participants view themselves as media-educated. The question was answered in an affirmative by 63.2 %, with the rest, 36.8 %, not regarding themselves as such. That said, just 7.9 % of the respondents were found to have attended thematic workshops, special courses, and summer schools on media education; 28.9 % were found to have attended an activity of this kind just once, whereas 63.2 % confessed to having never attended one.

Table 2. Respondents' Participation in Thematic Activities on Media Education

	Yes – a number of times, %	Yes – just 1 or 2 times, %	No, %
Have you ever attended workshops or courses on media literacy?	7.9	28.9	63.2

As evident, the percentage of respondents found to approach the issue of their media education in a systematic fashion is critically low – and that is considering that the overwhelming majority of the participants were found to, actually, think of that level as high. This is explained by the findings from the survey proper, as well as the findings from an analysis of the students' solving of situational and other problems as part of the course 'Democracy: From Theory to Practice'. In particular, in terms of the question 'How would you define the concepts of critical and systems thinking?' the majority of the students were found to have a superficial idea of both concepts, with the definitions they provided being, for the most part, a tautology and lacking in being complete and well-reasoned. Nevertheless, 93 % were found to view fostering the skills of critical thinking as essential in media education, and 94.7 % said the same about fostering the skills of systems thinking.

Likewise equivocal were the findings from an analysis of the respondents' level of trust in the media. Just 19 % said they had absolutely no trust in the media, and 52% said they trusted the media unquestionably. These results indicate quite a low level of being critical in evaluating the job done by the media – and that is considering that the overwhelming majority of the participants were found to be inclined to, first, trust state-run media outlets and, second, trust major online ones. The level of trust in social media influencers and major bloggers was under 15 %, and that in social networks was just 25 %.

Thus, the study's results indicate, on one hand, a somewhat inflated self-assessment when it comes to the level of development of media competencies, and, on the other hand, a really low level of media education and media literacy, with most misunderstanding the basic principles and mechanisms of working with information, fact checking, and analytics.

Based on the latest approaches to media education, the development of media literacy tends to take place in the context of the development of so-called "scientific literacy" – through integrated inter-disciplinary teaching by way of practical cases and problems. In this regard, it is worth noting the systematic nature of media education, which implies the use of an integrated approach to working with information. Consequently, of no less importance is the development of the skills of systems thinking – as an essential component of basic and professional media education.

Definitely of note is the fact that the use of the systems approach and algorithms for fostering the skills of systems thinking, along with those for fostering the skills of analytical and critical thinking, is currently a global trend, with the above increasingly viewed as key managerial competencies.

Systems thinking is the antipode of reductionist thinking, and may be viewed as systematic thinking about thinking (Dominici, 2012; Meadows, 2008).

Researchers B. Richmond and P. Senge both have suggested that systems thinking is the essential ability to see the general in the diverse and to think about how something dynamically interacts with other entities. The two scholars are convinced that systems thinking is linked with cognitive tools for exploring complex dynamic systems and models and schemes for cause-and-effect linkages and relationships. It is connected to one's worldview in its structured integrity and diversity of relationships (Richmond, 1994; Senge, 1990).

J. O'Connor and I. McDermott construe systems thinking as a special ability that is associated with the art of abstract thinking and implies the capacity for generalizing the particular and detecting relationships and consistent patterns between entities (O'Connor, McDermott, 1997).

L. Sweeney and J. Sterman define systems thinking as the ability to assess the behavior of a system in its non-linear dynamic complexity taking into account the mechanisms of positive and negative feedback, with a focus on identifying the system's behavior patterns within the boundaries of mental and formal models (Sweeney, Sterman, 2000).

Thus, in systematizing a set of definitions of systems thinking, one can identify several aspects that characterize it as a system of cognitive abilities and methodological instrumentariums for employing them in media education, which are as follows: capacity for abstractive thinking and analysis of several points of view; ability to solve problems with a vague structure and multiple purposes; ability to find new ideas in problem situations, when there are no off-the-shelf algorithms available to use; ability to identify interrelationships and interdependencies between a system's components and between various systems; ability to comprehend a system's complex dynamic behavior; ability to forecast changes and their effect on the operation of a system and an environment.

What is clear in this context is that it is all about a combination of various cognitive abilities, including the skills of analytical, critical, and systems thinking, which together facilitate developing an integrated insight into specific problems to solve them. In a generalized form, this interrelationship can be expressed as a hierarchy of abilities, as systems thinking appears to be predicated upon the capacity for the analysis and critical conceptualization of information.

Thus, fostering the skills of systems thinking implies not only and not so much preparing a specialist with a certain amount of knowledge that the person will be able to use in work but cultivating in them the skills of strategic planning and multi-tasking and the ability to approach the identification of consistent patterns and interrelationships between sets of components in an integrated manner.

Fostering systems thinking is directly linked with solving practical problems. Therefore, a crucial aspect of the process of media education is its practice-oriented, applied nature. The skills of systems thinking can be developed by way of special educational-professional activity with a view to obtaining the more effective solutions to problem situations. For this purpose, the learning material should be not descriptive but problem-oriented, contain a specific problem, and feature cases solving which requires a command of relevant methodologies of integrated analysis of media texts and information.

Table 3. Indicators of Systems Thinking and Methods for Cultivating It

Indicators of systems thinking in media education	Methods for cultivating systems thinking in media education
– systems organization of information; – locating alternative sources of information and ways of searching for it; – systems analysis of media texts and sources of information; – combining linkages and dependencies in analyzing information; – assessing the process and outcomes; – dynamic modeling and forecasting	– systems approach; – theory of inventive problem solving; – algorithms for solving problem situations; – systems thinking tests; – morphological analysis of a system; – situational tests; – creation of simulation models

An effective tool for cultivating the skills of systems thinking in media education is the theory of inventive problem solving (TRIZ) (Altshuller, 1999). Based on research into the dynamics of the development of technical systems, scholar G. Altshuller undertook to create what would be termed the "general theory of powerful thinking", which laid down the principles of organization of creative activity and activity related to non-routine solving of problem situations throughout the diverse fields of human activity, including science, arts, and media.

The TRIZ–ARPS methodology is a set of exercises incorporating practical cases that contain problem situations and can be solved via the identification of contradictions. An option of this type of exercises are situational problems and simulation models, which can help cultivate and develop the skills of planning, systematization, communication, critical conceptualization of information, etc.

A situational problem in media education can be composed of the following three key elements: 1) a scenario – description of the situation; 2) various question formats – e.g., questions with the choice of selecting or providing the worst answer option, questions with the best and worst answer options, and questions with an assessment of the answers offered; 3) a set of possible answers on the scenario. Thus, problems of this kind are typically solved by way of an algorithm for solving problem situations.

For instance, in today's climate of proliferation of fake news and misinformation, especially in relation to the COVID-19 pandemic, of special importance is one's ability to perform a critical analysis of related messages and information and follow a set of rules designed to help prevent the dissemination of false information, which includes the following:

1) Stop and think.
2) Check your source.
3) Ask yourself: Could it be a fake?
4) If you are unsure whether it is true, do not share it.
5) Check each fact, individually.
6) Beware emotional posts.
7) Think about biases (Spring, Carmichael, 2020).

It may be possible to solve the problem case 'Disinformation and Fakes amid the COVID-19 Pandemic' using a systems analysis methodology such as TRIZ–ARPS. Based on the logic behind this approach, we, firstly, can isolate a certain pool of information on COVID-19 available in the media that potentially is viewed by us as untrue and manipulative. For instance, this may be messages aimed at sowing fear and panic in society indicating the extent of the virus in China, conspiracy theories branding the Covid-19 outbreak as a "big pharma plot" or a "bioweapon unleashed on the world", disinformation aimed at inflaming the divisions in European countries, etc. (Covid-19 disinformation, 2020). This pool serves as the problem description (scenario) of our case.

Secondly, based on analysis of information in the media, we can come up with a set of questions answers to which will help establish a number of facts, namely:

– Who could benefit from this kind of information?
– Who would rather this kind of information never came out?
– Is this information targeted to a specific target audience?
– Which source of information (media outlet) was the first to report this information?

– Who is the author of the material? What is his/her background?
– Who is the beneficiary of the resource?
– Who could possibly be commissioning the production of the material?
– How objective is the author in his/her judgments?
– Does the material contain any hidden modalities or estimations?

Thus, by modeling a situational problem case after a specific example, we can put together a matrix of weak and strong questions and answers that can help identify apparent or possible contradictions in media messages, which can help foster a systems vision of the problem.

In addition to situational problems, another suite of exercises on fostering the skills of systems thinking is the systems thinking test, which is comprised of a set of numerical, verbal, and logical problems. The test is aimed at assessing one's ability to work with various types of information and analyze various processes, which requires quite advanced skills of systematization and searching for consistent patterns in logical sequences and in structural and cyclical schemes. These tests can be employed for the integrated investigation and assessment of one's skills in working with conceptual and abstract problems as part of an analysis of media texts.

A significant tool for fostering the skills of systems thinking is systems mapping, a method for constructing both regular and digital models of a system that involves defining all its elements, subsystems, and linkages and determining all interrelationships and interdependencies between them. Systems mapping is an effective tool for forecasting the behavior and operation of systems. For instance, systems mapping can be employed in structuring and systematizing mass media across a set of characteristics, like the nature and subject matter of the material, its objectiveness, the amount of non-obvious paid-for advertising, the media technology employed, etc.

It is worth noting that in analyzing work done by the media the researcher does not always possess a pool of credible information that could be employed for the purpose. On the contrary, the problem with the availability of such information makes it relevant to draw upon some unknown sources of information, information filtered by way of the skills of critical reconceptualization of information. In this context, a key role is also played by systems thinking, which helps order information and identify general attributes in the pool. In essence, solving a problem is a subjectivized experience of establishing contradictions that does not comport with most known ways of solving problems.

The TRIZ–ARPS methodology has proven itself as an effective tool for developing the skills of systems thinking, especially when it comes to the systems analysis and evaluation of media content and media context.

Table 4. Stages in Systems Analysis of a Media Text

Analytical stage	Operational stage	Synthetic stage
1) analysis of the information source and its reliability; 2) establishing the authorship of the information and the author's background; 3) availability of alternative sources of information; 4) identifying any factual inconsistencies	1) establishing the type, format, genre, and content of the media product; 2) establishing the conceptual accents in the media text and the language of the medium; 3) establishing the media technology employed and identifying the target audience	1) establishing who the beneficiaries and/or interested parties are; 2) interpreting and decoding the media text; 3) identifying any manipulative messages; 4) evaluating the media text from first- and third-person perspectives

Thus, systems analysis of information using TRIZ–ARPS is characterized by the following: the principle of interrelatedness and interdependence, which implies the non-linear processuality of thinking; the principle of dynamic combination of elements (facts) and subsystems (collections of facts); the principle of two-way communication (equilibration and reinforcement), as a reaction to the actions of the system as a whole or any of its component parts in particular; the principle of stochasticity, unpredictability, and accidentality in the development of systems.

5. Conclusion

Any education system should be regarded as efficient only as long as it meets the needs of the economy and reacts to global challenges in a timely manner. Processes related to the transition of our civilization to a new technological paradigm, the emergence of new science-driven sectors of the economy, and the rapid development of digitalization, informatization, and robotization throughout society have been altering many of the requirements for one's knowledge, abilities, and skills. In this climate, what is becoming particularly sought after is a set of skills related to communication, leadership, teamwork, flexible thinking, media literacy, and systems and critical thinking.

Extensive educational methodologies appear to have finally run their course, as increases in the amount of information are only extending the period of study and making it difficult to properly conceptualize information; knowledge is no longer acting as an impetus for thinking; the traditional focus on mechanical-reproductive learning and the way the current system of workforce training operates are no longer meeting the needs of the labor market, with the system no longer capable of nurturing the required number of proficient specialists involved in creative trades, polymaths with powerful non-linear, creative thinking skills.

In this regard, there is increasing relevance today, in terms of the educational process, in using individual-oriented methodologies and techniques that help develop a person's best, most powerful qualities. A methodology of this kind, in the author's view, is TRIZ–ARPS, which is aimed at cultivating the skills of systems thinking, as something that will be central to future pedagogical models, particularly a model of advanced pedagogy, with a focus on cultivating and developing the basic and professional competencies associated with media literacy and media education.

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