21st Century Skills: Education & Values, Academy, Community and Research Development and Implementation of the EACH Program

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Abstract

The social, economic and technological changes of the 21st century have increased the awareness of teachers and educational researchers of the importance of a relevant and interesting learning environment, collaborative learning, personalization and values in education.

However, most of the currently available programs focus on only one of these changes, making it difficult for the education system to implement all the changes together. In addition, the programs focus mainly on the pedagogical aspects and not on the constraints of the system. As a result, many of today's programs are pedagogically correct, but are very difficult to implement in educational systems.

The EACH model is unique in that it focuses on the combination of the learning environment, collaborative learning, personalization and values in education, and is designed in a way that takes into account the constraints of the educational system.

The assimilation of the model in Herzliya brought with it a reinforcement of pedagogical processes with an emphasis on the learning skills required of a scholar in the 21st century.

Accordingly, the EACH model is an implementable program for every municipal education system. The model uses a city's resources to provide learners with a meaningful learning experience and provides them with tools and learning and thinking skills that are adapted to the complex reality of the 21st century. The EACH model is based on four principles: (1) education & values, (2) academy, (3) community, and (4) research. The model has been successfully applied in the city of Herzliya, Israel, and is recommended for other cities around the world.

Keywords: educational program, collaborative learning, learning environment, school-community relations

1. Introduction

Global changes in science, economics, information, and technology illustrate growing gaps in the spheres of education, leisure, academics and employment (Bilecen & Van Mol, 2017). These gaps are evident between and within countries, and even between cities and various educational institutions (Zajda, 2015). Established areas of learning and employment sectors have disappeared in recent years. Employees who had not been trained in advance for 21st century skills have gradually been driven out of advanced industries, replaced by computerized robotic and automated systems (Schleicher, 2018).

Economic and social changes have altered the needs of the modern workplace in the world today (Eisenberg & Zelibanski, 2019). Surveys and research (Perry, Maehler, & Rammstedt, 2018) have been carried out to determine the skills and requirements for workers in the 21st century in order to prepare students for the changing world and for future employment in fields that we are not yet aware of: Program for the International Assessment of Adult Competencies: PIAAC.

An international program involving around 39 countries in the world examined the competence of people in the workplace (graduates aged from 16 to 60) in basic skills, such as academic reading, mathematical competence and solving complex digital problems. Problem solving in a digital environment requires reading skills and text comprehension, mathematics and understanding of basic technology (Martin, 2018). It appears from the survey that Israel is at a low skill level compared to many other countries. One of the conclusions that can be drawn from the survey is that the knowledge and skills which are today required in the matriculation examinations, and also in the admissions procedures of students to institutions of higher education in Israel do not reflect the 21st

century skills which are required (Eisenberg & Zelibanski, 2019).

The needed skills vary in purpose, but the education system will no longer be required to focus on memory-based knowledge, since that knowledge is available to everyone via the Internet (Schleicher, 2010). Many researchers view the new age with great uncertainty. Hence, the children who are now in the education system will need to adapt to this new world (Prensky, 2012). Research (Griffin & Care, 2014; OECD, 2018) highlights the fact that in order to acquire the skills of the 21st century, the emphasis must be on the acquisition of knowledge and extensive interdisciplinary skills; epistemic knowledge, cognitive, meta-cognitive, social, emotional and practical competencies, as well as values and social global norms. For each of these aspects, adaptations in the milieu surrounding the students - the education system, the parents, their peers and the community to which the children belong - will be required.

The lack of training and readiness of students for the skills of the 21st century has been and will be one of the main factors creating inequality between different populations within developed countries. The education systems and the higher education institutions are not prepared for, nor adapted to, the changes occurring in the 21st century. Inadequate education and changing employment policies are creating growing gaps in per capita income, thus further extending social polarization within and among countries (Muñoz de Bustillo, Sarkar, Sebastián, & Antón, 2018). One of the main objectives of educational systems around the world, regardless of their social, cultural and ethnic affiliation, is ultimately to produce graduates who are mature and ready for future learning and employment fields, even though some of these are still unknown (Schwippert & Wendt, 2017).

Education systems in Israel and around the world are attempting to assimilate various pedagogic programs, with the goal of adapting these systems to the skills required in the 21st century (Häkkinen et al., 2017; Nir, Ben-David, Bogler, Inbar, & Zohar, 2016). "Active Teaching and Learning", "Collaborative Learning", "Dialogue Learning", "Research Learning", "Individual Learning", and "Multiple Intelligences" are only a few of the attempts to diversify and enrich teaching styles, teaching methods as well as thinking and learning skills. These changes are needed to encourage curiosity, critical and creative thinking, independent learning, knowledge acquisition and finding solutions to complex problems (Kivunja, 2015; Loyens & Rikers, 2011). Unfortunately, these changes are integrated in only a few educational institutions, and when integrated, it is only to a small extent. The result is that many educational institutions retain approaches that are incompatible with 21st century needs (Han, Yalvac, Capraro, & Capraro, 2015; Laursen, Hassi, & Hough, 2016).

The EACH program was developed to meet these challenges. The purpose of EACH is to adjust education to meet 21st century demands, as well as 21st century students. This will accord cities that adopt the program systemic and structured integration, rather than partial and sporadic integration, which has characterized innovative pedagogies so far. The purpose of this article is to present the principles of the EACH program and to describe its implementation in the city of Herzliya in Israel. The article will first present the theoretical background from which the EACH program was developed and the pedagogical framework on which it is based. Next, the article will outline the four principles of the model (EACH: Education & Values, Academia, Community and Research). Finally, the implementation of the program in Herzliya will be described. The article will, then, present conclusions arising from the development and implementation of the program.

2. Theoretical Background

2.1 Learner's Achievement Goals and the Importance of the Learning Environment

Achievement goals are cognitive presentations of the future that guide the behavior of an individual prior to a situation that the individual wishes to achieve or avoid. With respect to learning, the achievement goals are typically to succeed in a learning task, or to avoid failing it (Ranellucci, Hall, & Goetz, 2015). The achievement goals are created as a result of the connections between the learner's beliefs and his emotional feelings in regard to the nature and content of the tasks imposed on him. The learner's attitude toward the achievement goals is influenced by the nature of the tasks assigned and the quality of the learning process (Kaplan & Yahia, 2017) and, accordingly, such is the extent of cognitive effort they will make throughout the learning process (Ballard, Farrell, & Neal, 2018).

According to the Goal Orientation Theory, the achievement goal is the result of motivation towards achievement, and, in this case, a learning achievement (Chadwick & Raver, 2015). According to the Self-Determination Theory, the achievement goal can lead to two types of behavior, choice or dictation (Ryan & Deci, 2008). When the behavior is driven by choice, one is internally motivated to perform the task out of satisfaction of completing the challenge within task. On the other hand, when the behavior is dictated, the individual is driven by external factors, and this motivation is solely to perform the task and not due to the interest or challenge involved in it (Cook & Artino, 2016).

The students set achievement goals that are influenced by the content to which they are exposed, and this varies according to their level of interest and curiosity. Students who are internally motivated display their abilities not only in order to demonstrate them, but mainly, to shape the learning process itself. Actions such as setting goals, presenting compelling arguments, choosing an action strategy, integrating information, planning, developing relevant discussion, and building a process to evaluate the final product are not only intended to demonstrate the progress in learning, but also serve the learner throughout the learning process (Ranellucci, Hall, & Goetz, 2015). Thus, the learning process is reflected in the strategy and goals of achievement that the students set for the task (McCardle, Webster, Haffey, & Hadwin, 2017).

When constructing a task to be assigned to students, the motivation is influenced by the connection between the content and the learning environments in which intellectual, social and cultural learning processes occur. The relationship between the content and the learning environment directly affects the students' motivation and achievement goals (Korucu & Cakir, 2018; McCaslin & Hickey, 2001). Pedagogically adapted learning environments influence how students link the achievement goals to their action strategies (Pintrich, 2000). Therefore, the learning environment is very important in order to develop achievement goals that will lead to internally motivated learning (Perez, 2017).

Although the research world understands the importance of the learning environment and its impact on students' motivation, still, most learning processes take place in classroom settings (Zaragoza & Fraser, 2017). The students in a classroom setting are cut off from any real connection with the local and global environment. In most cases, the curriculum is fixed and any slight interaction with external changes does not directly reach the students unmediated (Pilot, Taconis, & Den Brok, 2016). Studies that include interviews with students and teachers found that both students and teachers mentioned the contribution of learning outside the traditional classroom as being intriguing and relevant (Lai, Yeung, & Hu, 2016; Yunker, Orion, & Lernau, 2011). In addition, global and regional collaborative learning among students from different schools greatly increased students' motivation, relative to students in traditional learning settings (Harashima, Rawson, Kanda, Yamauchi, & Sato, 2015).

2.2 The Importance of Personalization in Education

The structure of the classroom and the physical and pedagogical natures of learning environments in schools has remained unchanged for a very long time (Carnoy, 2000). The goal of schools was to equip students with basic skills suitable for the era of the Industrial Revolution, and it has remained so for all students, regardless of their individual needs (Gomez, 2016). In recent years, innovative learning centers have been established within schools, but they do not necessarily indicate significant changes in the perception of teaching processes. The teaching processes have not been aimed towards 21st century skills, nor did they consider the individual needs of students (Peña-López, 2017). In order to promote meaningful learning, the school must adapt itself to the needs and abilities of the students - not the other way around (Gardner & Hatch, 1989; McClellan, 2006).

The situation in which students have to adjust to the teaching method used in the educational institutions is not consistent with the understanding that students have different characteristics, each with their own personal culture, personality, cognitive competency, motivation and learning skills (Freedman, 2015). This gap strengthens the need to develop innovative teaching processes that are suited to the students. Educational personalization is expressed in the student's ability to adjust the learning to his needs, abilities, preferences and interests (Colquitt, Pritchard, Johnson, & McCollum, 2017).

Personalization is an approach adopted from the world of technology, in Internet search engines and service-providing fields, such as medicine, transportation, fashion, etc. Educational personalization is implemented in teaching methods which are particularly adjusted towards the needs of students, including: individual learning, group learning, collaborative learning, and virtual learning (Zhao, Tavangar, McCarren, Rshaid, & Tucker, 2015). Because educational personalization meets students' needs and preferences, it contributes to their academic achievements, but it also improves their learning experience and thus promotes learning out of interest and internal motivation (Doucet, 2018).

3. The EACH Model

Based on the theoretical background presented, the EACH model was developed taking into account the importance of the learning environment, collaborative learning of students from different schools, and personalization in education. Due to the difficulties in implementing innovative educational models, the EACH model was developed to confront the practical constraints of the educational system. In order to develop a viable model, not just a successful theoretical model, this innovative solution incorporated the three pedagogic goals (a relevant and interesting learning environment, collaborative learning across schools, and personalization),

which could be achieved by one major systemic change.

EACH is an appropriate pedagogical model structured into the learning processes. The model presents a holistic approach that utilizes the formal and informal resources of a city and combines them with content experts from the community, academia and research industries. The model is aimed at developing personal empowerment, social mobility and multi-age collaborative learning, and allows autonomy in selecting the fields of knowledge, according to interest, challenge, and curiosity within formal and informal learning environments throughout the city.

This kind of learning is achieved no longer by confining the education to the school's premises, but by allowing it to expand throughout the city. The idea is to transfer the studies of a certain discipline from the school in which the student is enrolled to another school within the same city. Each school specializes in specific disciplines and serves students from various schools. This change requires system-wide coordination of the days in which the major subjects are taught, throughout the entire city. The students continue to study core disciplines in the schools to which they are enrolled while also studying in alternative study centers around the city (academic institutions, industrial and high-tech companies, and more).

The transition from the concept of autonomy within the boundaries of a school to autonomy within the area of a city encourages self-learning and collaborative learning according to the relevance and the interests of the students themselves. This process occurs by using available information while incorporating authentic, cognitive and metacognitive, personal and interpersonal, sensory and motor aspects, as well as a social-ethical aspect that contributes meaning and relevance among the educational, cultural and community institutions.

The EACH model enables practical experiential, problem-based, project-based, collaborative and mutual learning through joint presentation, sharing and building knowledge among students, as well as building joint community projects that are practical and relevant to their world. One of the main factors that increases students' internal motivation is the degree of freedom and autonomy given to students in planning, thinking, and collecting data, in a way that is different than the immutable, structured, traditional learning processes (Lawlor, Marshall, & Tangney, & Butler-Songer, 2000).

The EACH model enables synergy between group members which promotes the development of ideas and fruitful learning. It also encourages entrepreneurship and independent initiatives among students, schools, informal cultural institutions and content experts from within the community, research and academia. Therefore, learning processes based on the principles of the EACH model are an essential requirement in a society that desires to assimilate educational, social, economic and technological changes. The challenge that EACH takes upon itself is to create learning processes that link individual and autonomous learning to an environment that encourages collaborative learning, information and resource utilization throughout a city. For this purpose, the model is based on a combination of key principles that are integrated throughout the learning processes and are relevant for all areas of knowledge and all age groups in educational institutions: (1) education and values, (2) academy, (3) community and (4) research.

4. The Four Principles of the EACH Model

4.1 Education & Values

The principle of values education is integrated into all fields of knowledge, through learning processes that involve ethical and moral dilemmas and issues that are linked to the learning process and the curriculum. Discussions are held that involve ethical, educational and moral issues that are part of and relevant to the students' world. This social context is very important in the learning process because most learning involves maintaining relationships between people (Hanko, 2016). Social context reinforces the inter-relationship between the teacher and the students and among the students themselves. The social context enables teachers to identify, in a timely manner, the connection between the areas of knowledge studied and practical dilemmas and issues regarding ethical, social, and moral topics within the public agenda. This is done in order to consistently preserve the balance between raising ethical, social and moral issues and the processes of thinking, knowledge and information conveyed to students.

In order for each stage to deal with ethical and moral questions within a setting that enables learning, the teachers must always convey ethical messages and allow students to express their views regarding ethical, current and relevant issues (Franck & Osbeck, 2018). Thus, according to the Education & Values Principle, student involvement will be maintained by expressing views in discussion groups, in role-playing and in simulations that link a specific subject to the ethical content. At the same time, an in-depth educational process is carried out, in order to cultivate an influential adult in society, with a sense of responsibility and social

belonging.

4.2 Academy

The Academic Interdisciplinary Principle is carried out by building processes that acquire knowledge by investigating authentic, rich and relevant problems in different areas of knowledge and research. The learning processes are created through research, reading and thinking projects, which are led and guided by knowledge experts from the community, academia and research industries, as well as by teachers from the school. Skills, such as scientific reading, critical thinking, and academic literacy in the early days of school may enhance students' self-efficacy and motivation in future cognitive tasks, during their academic studies and throughout their lives (Rosman, Peter, Mayer, & Krampen, 2018).

In order to develop academic literacy and critical thinking, students are exposed to and read different types of articles, such as:

●   Literature surveys: meta-analysis and article review;

●   Theoretical articles that include presentation of the background on a topic (current or historical information), presentation of the idea, the theory, discussion, application, conclusions and summary;

●   Research articles that include theoretical background, research question, research method, findings, discussion of findings, conclusions and summary;

●   Case studies that include background presentation of the main topic, case presentation, discussion and conclusions;

●   Essays and position papers which present a personal opinion, subjective, but based on research, regarding a particular topic.

Experience with various academic and research articles and their exposure to global innovation in a variety of research fields assist the students in learning and analyzing various types of articles and enhance their capabilities during their academic studies.

4.3 Community

The Community Principle is a normative basis for creating social integration and achieving the sense of belonging to the group, to the environment and to the community. Relations between the community and educational institutions reinforce school students' social and personal values, enhance their civic identity, improve self-confidence and interpersonal communication, encourage acceptance of responsibility, planning and creativity in solving complex problems, and more (Epstein et al., 2018). According to the Community Principle in EACH, social-community interaction will be part of the curriculum structure and will be integrated in the learning processes of all areas of knowledge. The Community Principle is implemented through the acquisition of knowledge that is realized through development of joint ventures between the community and the school students, in order to create continuous mutual influence points between the community and the schools, as well as through cooperation between the schools and academic institutions, high-tech companies and research centers throughout the city.

4.4 High-Tech and Inquiry-Based Learning

The High-Tech and Inquiry-Based Learning Principle in the EACH model bases learning on research, in order to promote ways of understanding and thinking that involve curiosity and intellectual challenge, asking questions and solving complex problems. Inquiry-based learning processes enable coping with relevant challenges in a variety of areas of knowledge, problem-based learning, and higher-order-thinking (Hwang, Chiu, & Chen, 2015). The inquiry processes include the formulation of hypotheses, collection of information, analysis of data, construction of arguments based on facts, acquisition of results of experiments and studies, and drawing conclusions. The final product of the inquiry process is an academic seminar paper, which consists of an introduction, research question, literature survey, methodology, data collection, findings, data processing, analysis, conclusions and summary. The inquiry processes are adapted to the different age groups and change according to the subject.

The inquiry processes include observation and documentation outside the school premises in various research fields and in high-tech companies' research centers around the city. The inquiry processes are facilitated by teachers from the school, as well as by researchers from academia and high-tech companies. This also enables learning interaction between the research facilitators and the students and among the students themselves. Students learn to identify the underlying assumptions of arguments, search for answers to problems, ask complex questions, and develop thinking skills while constructing higher-order knowledge. The integration of

higher-order thinking into the school curriculum increases students' intelligence (Hwang et al., 2015) and assists students to maintain the way of thinking and the analysis processes of complex high-order problems, such as: important and unimportant differentiation skills, organization and mapping of information and knowledge, searching for causes of phenomena, comparing phenomena, drawing conclusions, discovering diverse points of view, finding proof, justifications and arguments for various arguments, creating problem-solving processes and intelligent use of metaphors and analogies.

5. Implementation of the EACH Model in Herzliya

The Herzliya municipality was the first municipality to fully implement the EACH program. The goal was to provide students with study tools; learning and thinking skills compatible with the complex reality of the 21st century in order to promote equal opportunities in education and to provide all students with independence, entrepreneurship, freedom of choice and the possibility for higher education as adults. This was a holistic city-wide model.

The program was implemented in collaboration with many people; the mayor and the heads of the city's education department, school principals, teachers, parent representatives, the municipal youth council, student council representatives, the Ministry of Education and higher education institutions as well as experts from academia and research industries. This broad collaboration aimed to recruit the various stakeholders in order to successfully implement the program successfully.

Implementation of the program required changes in the municipal education system on three main levels. On the logistical level, the days for studying majors were coordinated between the schools in the city. This allowed students to study their majors in other schools, not necessarily in the school in which they were enrolled. This change also created multi-age learning groups and it allowed students to pursue their areas of interest. On the personnel level, the program integrated experts (mentors) from the community, academia and research industries, as well as parents specializing in relevant fields, into all the learning processes in the schools. At the pedagogical-content level, emphasis was placed on virtual learning processes alongside frontal teaching, as well as developing the students' research and environmental skills, including outdoor activities in nature. In addition, learning was adjusted according to the EACH principles, and thereby emphasized social issues by developing informal communities of students, parents and educators, who developed valuable initiatives for community needs.

The disciplines currently incorporated in the program are: diplomacy and international communication, law and criminology/psychology, biotechnology, Russian for Russian speakers, French, research physics, design arts, satellites and space, the Middle East and Islam and ICT (information and communication technologies).

As a result of the program, junior high and high school students were able to take classes in other schools throughout the city, regardless of registration areas. The program also allowed high school students to complete their matriculation exams ahead of time in order to continue on to higher education. Student autonomy was increased by allowing selection of subjects that were not taught at school. In addition, learning was enriched by mentors from academia and industry, as well as learning in a research environment.

We saw from feedback that the level of the students' curiosity and motivation had increased significantly. There was also a significant change in the teaching concept among teaching staff. Teaching had become interesting, diverse, creative and relevant to the world of students.

The students who participated in the EACH program testified in a survey that they felt that they had greatly improved their ability to be a learner who plans his work, prioritizes processes, plans time efficiently, conducts research processes from diverse information sources, edits information collected and utilizes digital tools, etc. Moreover, the EACH model and the community it leads brought about an in-depth process of learning and research in teams, with collaborative learning, peer learning and peer feedback.

6. Conclusions

The EACH method is an innovative pedagogical system that was applied throughout the city and combined four main principles. The principles are structured into the teaching process, in all disciplines and for all age groups, from early childhood through high school. The program combines contemporary issues relevant to the students' world, from the social, community, academia and research worlds. The principles of EACH are consistently and moderately integrated into the learning program. The achievements were evaluated by methods compatible with 21st century skills. Complex pedagogic processes, along with EACH initiatives combine knowledge and interest with educational, community, academic and research values, and are ultimately aimed at developing the city's social, communal and scientific initiatives. The model enables personalization throughout the city, whether

formal or informal, in order to create social mobility, multi-age collaborative learning, autonomy in selecting subjects according to interest, challenge and curiosity, personal empowerment and lifelong learning.

The assimilation of the model in Herzliya brought with it a deepening of pedagogical processes with an emphasis on the learning skills required of a scholar in the 21st century. In all the schools in the city and in all age groups, from kindergartens to high schools, and in all disciplines, a culture of learning and teaching directed entirely to 21st-century skills was created. The teams of educators developed creative teaching units adapted to the EACH model that are based on the four principles of EACH - values, academia, community and research.

The EACH model combined the main trends of innovative pedagogy: a relevant and interesting learning environment, collaborative learning across schools, and personalization - combined together, rather than in segments. This is in order to enable implementation in practice in every city. Any educational system that seeks to adjust itself to the changes taking place in the world in the fields of science, technology, community, and academic research in the 21st century should use the EACH model.

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