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Science Literacy for Citizenship: Bridging the Gap. A Delphi Study of Arab and Lebanese Experts

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Abstract: The purpose of the present two-stage Delphi study is to examine how Arab and Lebanese Educators view the relationship of the Science Literacy and Citizenship concepts. It is known that students' 21st century science skills needed are used for being an active and responsible citizen. Many of the academics involved in the research were the Arab and Lebanese Experts who participated in the three-day conference about citizenship in 2014, organized by the Faculty of Education, Lebanese University. A first round survey was carried out, and a questionnaire on Citizenship and Science Literacy was administered via e-mail and returned by 28 experts in Education to Science Education at the Faculties of Education at Arab universities. Experts' responses were coded and categorized according to: students' citizenship skills, students' scientific literacy skills, educational challenges in terms of schools and society, curriculum development, teacher preparation, and the values of a good, digital and global citizen. In the second round survey, experts were again asked to comment on the depicted themes. Experts' opinions complemented each other and there were no controversies. All stressed on the diversity and the respect of the other. They all concurred that in order to live in an open society where all are respected one needs to discard and reject any type of discrimination and fanaticism. This research would contribute in: a) making a repertoire of citizenship skills by Arab and Lebanese experts, b) improving the quality of the science courses that tackle the concepts of science literacy and citizenship education at the Faculty of Education, and c) upgrading the in-service training programs that nurture the same concepts.

Keywords: Citizenship education, Science literacy, Delphi study, Active citizen, Global citizen

Introduction

The UNESCO report (2014) on Global Citizenship Education (GCE), states that GCE is a framing paradigm which encapsulates how education can develop the knowledge, skills, values and attitudes learners need for securing a world which is more just, peaceful, tolerant, inclusive, secure and sustainable. In the twenty first century, for instance, students are required to get used to debating multidisciplinary problems such as restricting carbon dioxide emissions in undeveloped or developing countries, or locating a nuclear or disposal facility among local areas. These social-scientific issues should be considered in multiple perspectives that integrate different disciplines (Kim & Aktan, 2014).

With the increasing importance and tendency of integration in school curricula of science and citizenship (e.g., Budapest Declaration, 1999; Guo 2014; Frayha, 2004; Inception Report on the Lebanese Education Reform: Citizenship Education, 2013; Mueller et al, 2012; PISA, 2015; UNESCO, 2009), it emerges the importance to know experts' views on students' skills related to science literacy for citizenship, from an Arab point of view.

In general, science Literacy is defined as: "Developing the ability to creatively utilize sound science knowledge in everyday life or in a career, to solve problems, make decisions and hence improve the quality of life." (Holbrook & Rannikmae, 1997, p 15). Furthermore, it is necessary to relate scientific literacy to an appreciation of the nature of science, personal learning attributes including attitudes and also to the development of social values (Holbrook & Rannikmae, 2007). Examples of social values: honesty, awareness of environmental issues,

especially environmental sustainable development themes (democracy, human rights, voting, media literacy..) (UNESCO, 2010) which are important for citizenship skills and for thinking skills such as critical and inferential thinking, making an opinion, that are important for science literacy. All of the aforementioned skills are assets for a responsible citizen.

In Lebanon, in its survey on education and citizenship: concepts, attitudes, skills and actions, the United Nations Development Programme (UNDP) (2008) indicated that civic knowledge amongst 9th grade students in Lebanon is low compared to their peers in other countries. However, their comprehension of the three main concepts related to citizenship, democracy, good citizen and state responsibilities was relatively high. Results of the Lebanese survey also showed strong support by students for the military role of the state as well as strong patriotic and independent sentiments amongst students, which in part may be a reflection of the general political turbulence that Lebanon is undergoing. Moreover, even though student interest in politics seems to be high, their expectations of political participation appear to be limited – a potential source of future friction. The survey also illustrated the extent, to which student's preference for political leaders is guided by their confessional affiliation, reflecting both the nature of Lebanon's social makeup and its strong political polarization. In addition, Frayha (2012, p. 112) the former Director of the Centre for Educational Research and Development (CERD) in Lebanon, emphasized that the outcomes of the Lebanese educational system indicate weakness in many aspects of its structure and function. He believed that the current state of the Lebanese educational system leaves little hope with regard to its ability to promote social cohesion and citizenship. To do this, Frayha (2012, p. 111) presented 10 important recommendations, two of these, were training in-service teachers on modern teaching methods, so that teachers are able to form future citizens. He also recommends that there should be regular revisions of the curriculum.

Current issues about citizenship and the national identity were grasping more and more attention (e.g., Faour & Muasher, 2011; International conference on Arab citizenship in the new political era, 2014; Drissi, 2014) because the Arab region was lately shaken by severe political turbulence and especially that Lebanon was surviving a violent surrounding. The gathering of academics was essential in order to discuss urgent matters related to citizenship education. Hence, in April 2014, the Faculty of Education, Lebanese University organized a conference in Beirut on *the role of the Faculties of Education in Citizenship Education and Identity*, where more than 26 deans and professors, from public and private faculties of Education from 10 Arab countries, attended this 3-day conference and they presented their views about citizenship. Thirty two researchers participated with valuable presentations related to the eight themes of the conference. These themes were:

1 - The role of the faculties of education in the preparation of the future teacher in light of globalization and challenges of civilization and knowledge.
2 - Citizenship and identity in the components of the Arab educational systems (philosophies, objectives, curricula, activities, assessment).
3 – The faculties of education and the crisis of identity and belonging among the Arab youth.
4 – The faculties of education and electronic means of communication and the use of electronic means of communication in the process of citizenship education.
5 - The role of faculties of education in education on citizenship and identity at different stages of education.
6 - The role of institutions of socialization and faculties of education in enhancing the life skills of citizens (the skill of dialogue, acceptance of the other opinion, tolerance, pluralism).
7 - Value education in the field of physical education and sports as a form of education in citizenship.
8 - Arab and international experiences in education on citizenship and identity.
Noteworthy to say, that more than 150 Arab and Lebanese academics have attended this conference. Their interventions were characterized by enthusiasm for the importance of the subject to every citizen and responsible academic, especially in the faculties of education.

As organizing committee members of this conference, we noticed that, on one hand, these experts did not tackle the concept citizenship from a unanimous Arab point of view and on the other hand, we did not talk about standard skills, e.g., in science, needed by students in the 21st century to becoming future and responsible citizens. Also, we are actually instructors at the Faculty of Education in the Science Education department. We found that it would be meaningful to do in-depth research on this topic *Citizenship* especially that the core outcome of Science Education is to prepare scientifically literate students and responsible future citizens (AAAS, 1993; PISA, 2015). Moreover, we also noticed that students focused in their learning and teaching practice solely on transmitting the subject matter and it is only in the last year of their regular enrollment at the faculty, that they could develop a more comprehensive approach to students' skills and outcomes in science.

The previous researches done in Lebanon about citizenship Education were about human rights and peace education in the Lebanese civics textbooks (Shuayb, 2015), students' concepts of citizenship and learning experiences (Akar, 2007) and civic education and active citizenship in Lebanon (Akar, 2012), but no studies till now tackled the relationship between science literacy and citizenship in Lebanon.

This research will help in a) having a clear frame of the concepts *Citizenship and Science Literacy* from an Arab point of view, and subsequently improving the quality of the science courses at the Faculty of Education regarding Science Literacy. Hence, the purpose of the present research is to examine how Arab and Lebanese Experts view the relationship of the concepts Science Literacy and Citizenship. The research questions are:

1. What are the Experts views about Citizenship?
2. What are the standard skills proposed by the Arab and Lebanese Experts about Citizenship needed in order to develop scientifically literate students?
3. How can we prepare scientifically literate and engaged citizens? And what are the actions and civic skills needed in order to prepare an active citizen in his/ her society/community/country?
4. Are schools and universities preparing a future citizen, global citizen?
5. What are the challenges/obstacles faced in preparing an active citizen in terms of, learning methods, teachers' preparation, curricula and students' practice?

Theoretical Background

Science Literacy and Citizenship Education

Many associations (AAAS, 1993; NRC, 1996) and numerous educators (Chiapetta et al, 1991; Höttecke, 2001; Lederman, 1998; Mayer, 1997; Miller, 1983) defined the concept of science literacy. In light of these definitions, a science literate person is someone who is familiar with the natural world; understands some of the key concepts and principles of science; has a capacity for scientific ways of thinking; is aware of the important ways in which mathematics, technology, and science depend upon one another; knows that science, mathematics, and technology are human enterprises and what this implies about their strengths and weaknesses; and is able to use scientific knowledge and ways of thinking for personal and social purposes (AAAS, 1993). Moreover, Lederman (1998) stated that science literate person can make informed personal and societal decisions by using scientific knowledge. Chiapetta et al. (1991) identified the four aspects of scientific literacy: 1) the knowledge of science, 2) the investigative nature of science, 3) science as a way of thinking, and 4) the interaction of science, technology and society (STS) (Figure 1).

Aspect	Components
The knowledge of science (Aspect 1)	• Facts, concepts, principles, laws, hypotheses, theories, and models of science
The investigative nature of science (Aspect 2)	• Using methods and process of science such as observation, measuring, classifying, inferring, recording and analyzing data, communicating using a variety of means such as, writing, speaking, using graphs, tables, and charts, making calculations, and experimenting • Emphasis on hands-on minds-on science
Science as a way of knowing (Aspect 3)	• Emphasis on thinking, reasoning, and reflection in the construction of scientific knowledge and the work of scientists • Empirical nature in science • Ensuring objectivity of science • Use of assumptions in science • Inductive and deductive reasoning • Cause and effect relationships • Relationship between evidence and proof • Role of self-examination in science • Description of how scientists experiment
Interaction of science, technology, and society (Aspect 4)	• Impact of science on society • Inter-relationships between science, society, and technology • Careers • Science-related social issues • Personal use of science to make everyday decisions, solve everyday problems, and improve one's life • Science related moral and ethical issues

Figure 1. Science literacy (Source : Chiapetta et al, 1991)

Osborne et al (2003) did a 3-round-Delphi study of the 'expert' community extensive study on what *ideas-about-science* should be taught in school science. They found that students should learn about the following themes: science and certainty, scientific method and critical testing, hypothesis and prediction, creativity, historical development of scientific Knowledge, diversity of scientific thinking, analysis and interpretation of data, science and questioning. In addition, Duschl (1990) also suggested like other educators (Millar & Osborne, 1998) to pay more attention to teaching *explicitly* about the nature of science, its epistemic base and the significance of its cultural achievements.

Jenkins (1997) identified seven features in an individual that is an ordinary citizen's approach to science. Among them were: *informed citizens make more discriminating judgments about science and technology related issues:* The more informed citizens are about scientific issues, the more they are able to understand the consequences and make better judgment. However, this does not automatically mean that they would necessarily make more rational decisions.

Ratcliffe (1998) provides a wider framework for the contribution of three aspects: scientific concepts (content); practical processes, observational, experimental skills (process); and values and beliefs, cultural and historical contexts, social and environmental issues (attitudes) as overlapping. The intersection of the three components provides students with a view of the nature of science (Figure 2). Science education has so far focused on the transmission of content and the process of doing science. However, it is noteworthy that the third aspect of values and beliefs has been somewhat neglected. It is only recently that science educators have turned their attention to the social and ethical implications of science as a response to the hype produced in the media by research activities such as those in the area of cloning and genetically modified organisms or GMOs (Gatt, 2005).

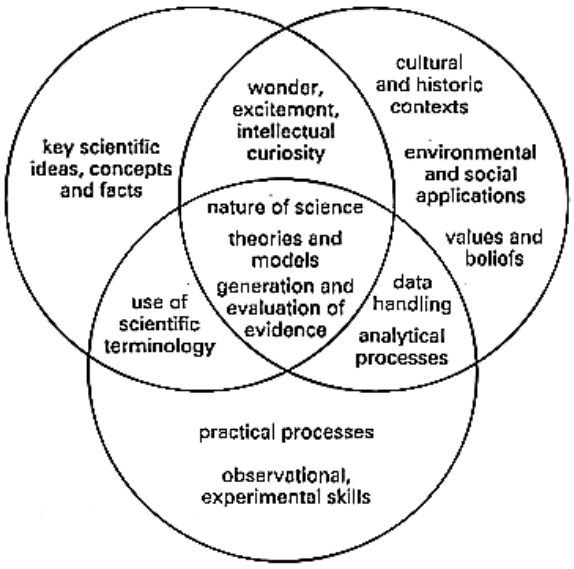

Figure 2. Elements of science (Source: Ratcliffe, 1998, p.8)

Framework for 21st Century Learning

The P21 Partnership for 21st Century Learning defined the Framework for 21st Century Learning; they indicated on their website (www.P21.org), what students should know and be able to do to succeed in the 21st century global economy.

Learning & Innovation Skills – The 4C's

- Critical Thinking and Problem Solving
- Communication
- Collaboration
- Creativity and Innovation

Information, Media & Technology Skills

- Information, Media & ICT Literacy

Life & Career Skills

- Flexibility & Adaptability

- Initiative & Self-Direction
- Social & Cross-Cultural Skills
- Productivity & Accountability
- Leadership & Responsibility

Figure 3 displays alignment between 21st Century Citizenship and the Framework for 21st Century Learning (2014).

Demands of 21st Century Citizenship (Local, State, National, Global)	Competencies in the Framework for 21st Century Learning
Understanding the functions, levels and processes of government	Civic literacy
Exercising the rights and responsibilities of citizenship	
Making thoughtful personal economic choices and understanding how they that may impact society	Financial, economic, business and entrepreneurial literacy
Understanding global health issues and working to improving personal and societal health	Health literacy
Appreciating and learning from other cultures, languages and nations	Global awareness
Committing to individual and collective action to address environmental challenges	Environmental literacy
Generating new ideas that help benefit communities	Creativity and innovation
Knowing how to make difficult decisions and solve problems in innovative ways	Critical thinking and problem solving
Communicating with others effectively	Communication
Engaging with others in a spirit of compromise to accomplish common goals	Collaboration
Accessing and evaluating information effectively	Information literacy
Creating and using media as a tool for sharing ideas and working with others to solve problems	Media literacy
Using digital technologies to accomplish civic priorities	ICT (information, communication and technology) literacy
Adapting and changing to find solutions	Flexibility and adaptability
Taking the initiative to identify, explore and contribute to solving challenges	Initiative and self-direction
Leveraging social and cultural differences as a civic asset	Social and cross-cultural skills
Meeting goals in the face of obstacles	Productivity and accountability
Inspiring others towards a shared vision for the common good	Leadership and responsibility

Figure 3. Alignment between 21st century citizenship and the framework for 21st century learning (source: P2, 2014)

Life skills and citizenship education in MENA Region

The UNICEF MENA report (2017) proposed life skills defined within the Conceptual and Programmatic Framework (CPF) as cognitive and non-cognitive, higher-order, transversal and transferrable skills for learning, for employability, for personal empowerment, and for active citizenship. The CPF proposed a conceptual and definitional understanding of 21st-century skills based on a four-dimensional model of learning. The LSCE Initiative revisits the concept of life skills and citizenship education in Middle East and North Africa (MENA), while providing a roadmap that is relevant to the regional 21st century context. According to Life Skills and Citizenship Education or LSCE, the development of the CPF has included an extensive mapping and review of national, regional and global definitions that reveal a lack of consensus on what should define and constitute the skills of the 21st century. A set of 12 core life skills for MENA has been identified using the four-dimensional model (Figure 4). They are: creativity, critical thinking, problem-solving, cooperation, negotiation, decision-making, self-management, resilience, communication, respect for diversity, empathy and participation.

Figure 4. The 12 core life skills for MENA region (Source: UNICEF MENA report, 2017)

The four dimensions of learning are of LSCE: the cognitive dimension or *Learning to now*, the instrumental dimension or *Learning to Do*, the individual dimension or *Learning to Be* and the social dimension or *Learning to Live Together*. The latter is the ethical dimension that reinforces the vision for citizenship education in MENA. It adopts a human rights-based approach consistent with democratic and social justice values and principles.

Teachers and facilitators have a critical role in putting active learning into practice. The experience of successful education reforms indicates that equipping and supporting teachers to practice active learning methods can bring about significant change in learning outcomes and best supports life skills and citizenship education. The role of the teacher is often that of a facilitator, supporting learners as they learn and develop skills. In this approach, it is important that the teacher has a full understanding on the methods that enable the learner to learn effectively. Figure 5 illustrates the main teaching and learning principles that contribute to the development of the 12 core life skills.

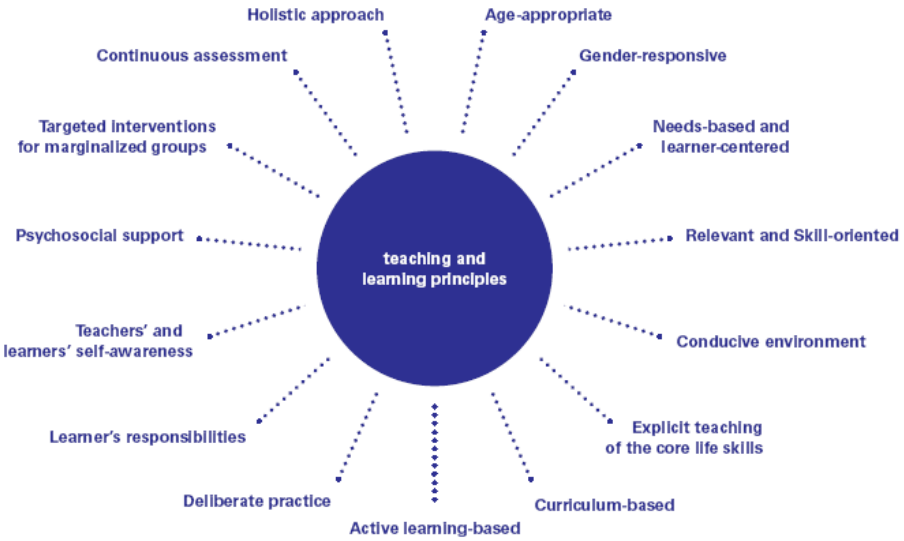

Figure 5. The main teaching and learning principles of the 12 core life skills (Source: UNICEF MENA report, 2017)

Method

Developed by the RAND Corporation in the 1950s, the Delphi technique is an expert survey for ―systematic solicitation and collation of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses (Delbecq, Van de Ven, & Gustafson, 1975, p.10). The Delphi technique consists of many rounds such as open-ended and Likert-scale surveys, the method is considered as both a qualitative and quantitative approach. (Avella, 2016; Okoli & Pawlowski, 2004). Time management is one important consideration of this method because late responses from certain panel members might slow down its entire process (Wiersma & Jurs, 2009). The current research is a Delphi study and its approach is a mixed research. The data collection tools were two questionnaires on citizenship administered via e-mail, in two stages, to the experts from 2015 up till 2018. The Delphi study includes two rounds; in the 1st round, 28 experts filled in the questionnaire and returned it back by hand or via email. For the quantitative data, the software package, Excel was used. Qualitative data were coded and categorized and themes emerged. In the 2nd round, 15 experts answered to the second questionnaire. The first questionnaire consisted of 11 open-ended questions. The experts answers and comments were coded and categorized according to six themes: good citizen, qualities of a good citizen, qualities of a digital citizen, qualities of a global citizen, science skills to be developed by science teachers to enhance citizenship, actual situation of citizenship teaching skills and obstacles/challenges in terms of: learning-teaching methods, teachers' preparation, curriculum and student's practice. The second questionnaire consisted of seven statements, resuming the experts' responses in the first round.

Sample Description

Participants in this research were Arab and Lebanese academics, some of them participated in the conference about citizenship in 2014.

The participant experts were actually teaching at university level. Their field of instruction varied from: General Education, Science Education, Early childhood Education, Philosophy of Education, Psychology, Special Education, Educational Leadership, History, and Citizenship Education. Their teaching experience varied between 3 and 40 years.

Results and Discussion

In the 1st round and based on data from Questionnaire 1, experts' answers were coded and categorized and analyzed. In the 2nd round, Questionnaire 2 was sent to the 28 experts who had filled in the 1st questionnaire. Experts have to reach to a consensus on the seven statements. Actually, 15 experts filled in and returned Questionnaire 2. They presented their comments and their suggestions for improving the present civic education curriculum.

1st Round Results

To research Question 1: What are the Experts views about Citizenship?

Table 1 shows the experts emerged answers related to the good citizen.

Table 1. What's a good citizen?

	Experts' answers and Frequency
Actions	Knows, respects and applies the laws of his country/abides by the laws (13), tolerance towards others (11), does not steal (10), deals with humanity with others (6), respects and applies the human laws without sexual, religious and social discrimination (5), works on improving his/her community (4), takes initiative in serving his community (4), Uses his knowledge and skills in his personal life and for the welfare of his society and country (4), preserves the public and private properties (4), keeps away from religious and political fanaticism (3), puts his/her country interest before his/her own interest (2), active in social reform (2), pays taxes and doesn't steal from the country properties (2), does not accept other nationality (2), preserves his country as his/her family (2), steward of the cultural heritage and the environment (2),treats others the way he/she would like to be treated (1), participates in putting the law (1), respects and celebrates diversity (2), works towards social justice (1), participates in elections (1), participates in the country sociopolitical decision making (1), contributes to the production of knowledge (1), works on the his/her wellbeing, others' life and his/her environment (1)
Values and Skills	Honesty (10), diversity (9), sympathy with other needs (7), critical thinker (6), disciplined (4), accepts and cooperates with the other (3), faithful to his country (3), believes in equality and freedom (3), respects the common values of the country where he/she lives (2), has commitment and loyalty to his/her country and nation (2),respects and upholds the constitution (2), respects oneself and others (2), belongs to his/her country (2), he/she thinks, analyzes and can change his/her mind if he/she convinces (2), self-controlled (2), defends his country whenever there is a need (2), independent (1), self-confident (1), a free person (1), proud of his/her nationality (1), has democratic participation skills (1), knows what he/she consumes (1), has decision making for the public good (1), ready to sacrifice for his/her country and his/her society (1), has opinion and attitude towards social and political issues (1), loves and preserves his/her country as his/her family (1), respects the other even when he/she disagree with them (1)

Tables 2, 3 and 4 depict the qualities proposed by the academics of a good citizen, a digital citizen and a global citizen.

According to the experts, a good citizen respects first of all the laws and respects private and public properties. He /she has social values and is a critical thinker. A good citizen participates actively in democratic settings, honest, tolerant and respects diversity in society (Table 2).

Table 2. Qualities of a good citizen

Experts' answers	Frequency
Respects the laws	13
Respects the civil and social values	10
Be responsible whether he is a student, teacher, soldier or employee…	8
Respectful	6
Critical thinker	6
Participates in elections/ Voting /democracy	5
Applies critical thinking in his behavior without fanaticism	4
Compassionate/ Be compassionate toward his country	4
Accepts the other	4
Respects diversity of the society	3
Honest	3
Tolerant	4
Participates in civic activity	3
Has scientific reasoning	3
Has initiative	2
Loves his country	2
Respects public and private property	2
Proud of his national identity	2
Has commitment to humans and his country	2
Loyal first to his country	2

Self-responsible/responsible	2
Pays willingly taxes and monetary duties	1
Participates in the public service/ helps in solving social problems	1
Open-minded	1
Self-confident	1
Informed decision making	1
Environmentally aware	1
Contributes in development and societal change	1
Takes responsible action for protecting the natural resources of his environment/Earth	1
Participates actively in public issues	1
Cooperates with others regardless of his religious, political and his regional commitment	1
Involved in the voluntary services that contribute positively to the wellbeing of the community	1
Values team work	1
Advocates for the equal human rights for all	1

A digital citizen is able to use ICT, is objective and critical thinker. He/she has ethics, such as, honesty and treats others with respect in online spaces and never cyberbullies. A digital citizen should communicate with others in foreign languages (Table 3).

Table 3. Qualities of a digital citizen

Experts' answers	Frequency
Ethical concerns/Ethics in social media/ respects the civilized behavior and the dialogue in the social media	5
Able to use modern technological tools	5
Interactive with others on the social media	4
Open-minded	4
Respects the intellectual property rights	4
Able to benefit from technology/ uses social media effectively/able to use social media	4
Uses technology /for the service of human being	4
Treats others with respect in online spaces and never cyberbullies	4
Objective	4
Able to make research/construct websites /programming	3
Critical thinker	3
Honest on the social media/ Honesty /integrity	3
Active on the social media	3
Respects privacy, communication and freedom of speech	3
Good use of the internet	2
Use of the internet as search tool	2
Knows foreign languages	2
Responsible	2
Does not steal digital property	1

Table 4 depicts the educators' answers; in their opinions, a global citizen has an open mind, he/she values differences, uses his/her critical thinking skill to judge events from around the world, as well as, respects the environment. A global citizen refuses any sort of discrimination and racism, can communicate in foreign languages and he/she able to use the social media effectively.

Table 4. Qualities of a global citizen

Experts' answers	Frequency
Open-minded/ not extremist	8
Respects the other and respects/recognizes/values differences	7
Open to other cultures/open to others	4
Accepts the other	4
Respects the environment	4
Aware of social justice and equity	3
Uses critical thinking in his behaviors/of events from around the world	3
Acts, individually and with others, to improve the economic, cultural, social and environmental status of the world	3
Knows foreign languages	3
Exhibits actions that can contribute to the overall wellbeing of the global community, such as the global warming	3
Committed to the international law of human rights and the charters regulating relations between states and individuals	2
Refuses any racial and ethnical discrimination	2
Tolerant/ tolerance of various opinions and multiple perspectives	2
Uses technology	2
Able to use social media	2
Believes in social justice, freedom and democracy	2
takes initiatives in solving local and global health and environmental issues/environmental concerns	2
To free himself of prejudices and old stereotypes	2
Refuses any kind of discrimination and racism	1
Has interests about issues outside his country	1
Considers \ cultural varieties as richness to the humanity	1
Honesty /integrity	1
Aware of his national identity	1
Interested and concerned about the global environment	1
Defends the rights of minorities	1
Aware of the dangers of blind nationalism	1
Engages in international humanitarian organizations	1
Collaborates with NGOs and other partners to make the world a more equitable and sustainable place	1
Is proficient in using technological means of communication such as internet or other	1
Exchanges experience and knowledge	1
Believes in equality among people and nations irrelevant of the color, religion and prosperity or backwardness	1
Realizes that this planet is for all people and ethnicities	1

To research Question 2: What are the standard skills proposed by the Arab and Lebanese Experts about Citizenship needed in order to develop scientifically literate students?

In order to answer this question, all experts were asked a) to answer the question: what skills do you ask from science instructors to develop in students in order to prepare future active citizens? and b) science educators were asked to answer the question: What skills in science do you think we should develop in order to prepare future citizens? Their responses were categorized according to the 4 aspects of science literacy (Chiapetta et al, 1991).

Data tabulated in Table 5, show that educators tend to mention skills related to the aspect 3 of science literacy, or science as a way of thinking.

Table 5. Experts' answers analysis according to science literacy

Experts (N=28)	Aspects of Science literacy			
	Aspect 1 (Science as a body of knowledge	Aspect 2 (Investigative nature of Science)	Aspect 3 (Science as a way of thinking)	Aspect 4 (STS)
	Frequency= 1	Frequency= 14	Frequency= 27	Frequency= 9
Educators (N= 22)	updates his/her teaching,	lab work skills, research skills, organization, puts rules for each work, respect instructions and regulations, experimentation, develops independent inquirer, scientific method, inquiry, discovery, communication, engages students in interactive discussion and debate, role-play regarding citizenship, design citizenship activities for students	Decision making skills, scientific thinking, scientific reasoning, enthusiasm, analysis, self-confident, objective, positive thinking, respects himself and the others, problem-solving skill, creativity, open to different ideas, group work, respects the intellectual property, does not make plagiarism, takes initiatives, tolerant, critical thinking, cooperation, respect of other rights, responsibility, open-minded, being skeptical, collaborates with others for finding solutions to local and global problems, conflict resolution skills, creates a safe classroom environment that encourages students to express their own values and opinions	Knows how to use ICT, relates science with real life situation and daily problems, develops social skills and not only emphasize on intellectual skills, promotes social justice awareness, ethical, active participation, engagement, democratic skills, sense of responsibility towards global issues that threaten humans
	Frequency= 1	Frequency= 4	Frequency= 12	Frequency= 1
Science Educators (N= 6)	Intellectual skills such as; knowledge in science,	Discovery, problem solving, practical processes skills communication,	Honesty, integrity, skepticism, perseverance, analytical skill, decision making, collaboration, reflection, self-learning skills, open minded, curiosity, Argumentation	Integration of technology

	skills, especially on teaching socio-scientific issues, evidence based learning

To research Question 3: How can we prepare scientifically literate and engaged citizens? And what are the actions and civic skills needed in order to prepare an active citizen in his/ her society/community/country?

To answer this question, Table 6 represents details of educators' various points of view and it indicates the actions suggested by the experts, categorized into themes: family, school and society. Table 7 represents experts' views about skills and values needed to prepare an active citizen in his/ her society/community/country?

Table 6. Experts' actions to be taken for preparing scientific literate and engaged citizens

Family/Society	School/University
Do not impose his ideas on others	Encourage social activities (artistic, environmental, scout)
A family that elevates her sons and daughters on dialogue, tolerance and acceptance of the other	Developing scientific values
Show respect	Changing curricula
Family has an important role by building up behaviors and values that concentrate on the sense of responsibility	Changing training programs curricula and teaching methodologies
encourage discussion in a democratic atmosphere and respects children rights in expression and the rights to learn and to get access to knowledge Mingle with others from different sectarian and religious background. This can lessen fanaticism	Engage students in debates on moral, ethical and societal issues related to their lives and the human nature
Strengthen family ties	Teaching evaluation skills to assess quality of information sources and provided evidences
Take part in national ceremonies	Continuous follow-ups and evaluation of teachers
Encourage honesty in daily routine	Changing conditions for recruiting in-service teachers
Participates in social and humanitarian organizations	A school that builds the personality of the student differently as it is now, where the actual system is based on isolation and sectarian feelings
Changing laws	A university relies on critical thinking, that requires a teaching staff with international and scientific thinking
Provides the followings: a society based on knowledge and not on sectarian feelings	Make the university time a space of interaction that leads to break rigid frames and models
Involve students in community services	Institutions based on transparency and questioning
Media information in general about science	Put common objectives for all schools
Put Legislations and accountability system for irresponsible actions that harm oneself and other people	Provide students with the opportunity to take decisions regarding their learning
Voting	Use technology to enhance student discussion of issues that impact their lives through video-conferencing and forums
Volunteering in civic and social institutions	Encourage students to propose solutions to worldwide problems. Encourage reading, reading, reading…
Participates in social and humanitarian organizations	Teach through inquiry
Modeling good citizenship through media	Insist on the importance of general culture, science and humanities and including culture in the core of curricula and media programs
	Ensure occasions for students' participation and Provide them the opportunity to be informed with cultural and scientific in the world
	Review the curricula and to include national

textbooks with the elements of citizenship, that can be used in class activities
Change the teaching methods used by teachers in a way that they adopt active teaching that involve learners in the teaching process
Emphasis on the 4 aspects of science literacy of Chiapetta et al (1991)
Reinforcing students' spiritual, moral and cultural skills
Include history of science and not only scientific facts and discoveries. In this way, student can learn how science reveals and solves controversies, so the society develops and progresses through changing, renewed and revised scientific theories
Teach students to listen to all, especially those who are different
Teach students to examine information carefully, in order to make sure it is true and real
Teach them cooperative learning groups
Teacher should explain to students what "scientific" truly means and entails, i.e., what is science? What is an experiment? What is evidence-based?
Engage students in community services
Creating a shared vision and a common understanding of what we mean by a good citizenship and more importantly, how one can be a global citizenship respecting and caring diversity of mankind, and caring for the whole Earth
Designing curricular activities to achieve all objectives related to citizenship
Developing a reliable assessment that measures student progress toward the desired goals related to citizenship
Promoting and encouraging community services, locally and world-wide
Develop the spirit of participation in children and stimulate social sense through volunteering and teamwork
Ensure that proper measure and consequences are applied when a citizen breaks the rules
Stimulate the culture of diversity and acceptance of the other
Develop the spirit of personal responsibility
Teacher preparation that serves the formation of active citizen, include this goal in school message and official curricula and to realize this goal in the form of extracurricular activities.
Coordination between social educational institutions (family, school, media..) in order to prepare an active citizen
Encourage students to plant and to take care of their growth, in order to get attached to his land
To shift from the concept of receptive teaching to Productive learning
Allow students to develop their skills at school by providing a democratic school culture
Teach "how" to think, not "what" to think

Table 7. Experts' needed values and skills to prepare an active citizen

Values and Skills	
Moral and social values such as, Ethics. Tolerance Responsibility. Accountability. Trustworthiness. Compassion. Fair and just. Honesty. Integrity, perseverance, listens to others, respects the other	Community service and societal and environmental level
Develop critical thinking, and thinking outside the box	Leadership
Self-assessment	Take initiative
Develop communication and investigation skills	Attachment to national identity
To be informed citizens, responsible and aware of their duties and rights	Teach students to respect rules and laws (stand in the line, stop on the red light..)
Get rid of egocentrism	Awareness of own and others' rights
Develop participation skills	Participation in the political process
Be responsible	Conflict resolution and negotiation skills
Develop self- confident	Autonomous thinking
Aware that decision-making needs to be based on scientific evidences	Evidence-based decision making
Develop communication, intellectual and critical thinking skills, self- thinking skill	Argumentation
Loves discovery and scientific knowledge, skeptical, resists intimidation, not to be naïve	Sensitivity to group differences and mutual understanding of others
Scientific thinking	Develop self-confidence
Critical thinking	Creative skills
Communication	Thinks positively
Decision-making	Discovery
Group work skill	Objective

To Research Question 4: Are schools and universities preparing a future citizen, global citizen?

All experts agreed that because of receptive learning, civic education doesn't help in developing learner personality. Most agreed that we need interactive and active teaching strategies in order to better teach this discipline. And that student behavior reflects his family and society. In Lebanon, for instance, Lebanese experts pointed out that Lebanese civic education curriculum does not include about citizenship and not about digital and global citizen too. Here are some excerpts of academics' views:

Expert 10 (Science Education): *Even though I cannot generalize because there is no research on the topic, I do not think that there is a concerted effort in schools to prepare active and productive citizens. This is possibly due to the curriculum examination system, as well as teaching practices.*

Expert 12 (History of Education): *Schools in Lebanon do not certainly prepare future citizens not on the national level. This is because of the actual relation in school at the level of teacher-school curricula and behavior. The relation between teacher-student is a copy of the authoritarian relation of the parents at home. Student cannot develop his personality differently than his parents by expressing his opinions about issues related to his life. Even tasks and research students should do is based on copying information without discussion them and interaction. The school-university system is producing a citizen copy of his parents and the teaching staff. He is a receptive person ready to get instructions and to follow them without criticizing or discussion them.*

Expert 20 (Special Education): *Yes we prepare future citizens through teacher preparation programs. Our learning methods utilize recent technological advancements, experiential and reflective teaching approaches and empowering students, who become effective teachers/leaders in the community. Students are affected with their environment and surroundings. What happens nowadays in Lebanon and the Arab countries affects students morally and psychologically and it affects their behaviors too. Unfortunately, the school is an open place and it interacts continuously with the outside environment. I think that schools can students immunize against negative external actions and behaviors but what we see as taken actions is not enough.*

Expert 26 (Psychology): *I do not think all schools are and some are only doing a partial job. Global citizenship is a concept and framework that should be embedded in all areas, act is not in most schools.*

To Research Question 5: What are the challenges/obstacles faced in preparing an active citizen in terms of, learning methods, teachers' preparation, curricula and students' practice?

Arab and Lebanese universities experts showed a pessimistic view about civic education at school and university levels, teacher training programs and student practice. All experts agreed on the outdated curricula and they approved that teacher preparation and intensive training programs for in-service teachers lack the development of teachers' skills related to citizenship and how they can include citizenship skills in their disciplines. Experts presented a wide spectrum of answers. Here are some excerpts:

Expert 4 (General Education): *Dependence on lecture strategy. This does not contribute to the development of a citizen personality, but pushes him towards memorization and not search and cooperation. Teachers cannot develop in their students' citizenship skills if they did not know about citizenship education. Teachers should learn about civic education during training programs, but one course is not enough. Moreover, instructors who will teach this course should be specialists and not instructors who read a book or a paper about citizenship. In general, curricula include some citizenship elements, but we need to realize the citizenship objectives. If curricula developers and teachers are not well informed about citizenship, then nothing positive will occur. Students' behaviors are the end-of-product of civic education. What we see in most students' behaviors does not reflect any influence of the school civic education in developing their personality. Students are still copying their parents' extremist attitudes and this reflects the weak role of the school.*

Expert 5 (Early Childhood Education): *Teaching strategies rely on memorization and they do not opportunity for students to construct an opinion and attitude. Not renewable, active learning but not group learning. Teachers are not democratic; do not renew their teaching and knowledge. They do not know the basics of group work. Not updated and renewed. Dense and overloaded. Topics not related to students' interests. School and curricula isolated from society. Concentration on isolation skills (family, then parents, then district, village and finally the city and no indication of the global context). Cold curricula and faraway of anything that can cause sensitivity and therefore curricula have weak or negative impact.*

Expert 2 (General Education): *Teaching methods in majority do not respect active learning that allows the construction of scientific thinking. Curricula and teaching methods are still concentrating on knowledge and do not contribute for the construction of skills and competencies of active learning. Curricula concentrate on knowledge and assessment measures the low-achievement thinking levels (memorization, comprehension, application). Students' behaviors are linked to their environment: family and society.*

Expert 3 (Science Education): *The existing educational system and the people who run it. Emphasis on memorization in national exams. Low teacher salaries. Low quality teacher preparation systems. Lack of respect of the teaching professions. Lack of control over the entrance into teaching. Hegemony of testing. The dense curriculum with content that is not up-to-date. Focus on knowledge rather than thinking skills. Lack of relevance of the content students' lives. Student behavior is a reflection of the low quality curriculum and teaching*.

2nd Round Results

The 2nd round, Questionnaire 2 was filled in by 15 out of the 28 experts, involved in the study. After coding the experts' comments, experts' responses were summarized in the form of statements and they were acknowledged by the experts. These statements are figured below (Figure 6).

Statement 1: A good citizen is an active citizen who respects his country's laws and serves it.
Statement 2: For the quality of a good citizen, educators emphasize on:
Respecting the civil and social values,
Being responsible, compassionate toward others' needs,
Accepting and respecting the other,
Respecting diversity and being tolerant,
Developing scientific reasoning and most of all, he/she has "critical thinking skill",
Has a vast general culture,
Being involved in community service.
Statement 3: For educators, the digital citizen is:
Honest and has integrity on the social media,
Able to benefit and to use technology and social media effectively,
Has ethics in social media,
Respecting privacy, communication and freedom of speech,
A critical thinker,
Respecting the intellectual property rights.
Statement 4: For educators, the global citizen is:
Active on the global level,
Present and engaging in international humanitarian organizations,
Tolerant, open to other cultures
Able to communicate with many languages and with modern technological tools,
Open-mind and valuing diversity.
Statement 5: Experts agreed that because of receptive learning, civic education doesn't help in developing learner personality. They agree that we need interactive and active teaching strategies in order to better teach this discipline. And that student behavior reflects his family and society.
Statement 6: Experts agreed on the outdated curricula, and that civic education curriculum does not include about citizenship and not about digital and global citizen too.
Statement 7: Experts agreed that teacher preparation and intensive training programs for in-service teachers lack the development of teachers' skills related to citizenship and how they can include citizenship skills in their disciplines.

Figure 6. The majors point of views of experts

A consensus was reached and experts presented their comments on the study; they have commented on the teaching and student practice, as well as on the actual civic education in schools. Also, they suggested ways to improve teaching about citizenship in schools, such as practical activities linked with theory and students' participation in civil society service. Some experts' answers are represented below:

Expert 1 (Science Education): *I completely agree on statement, regarding the qualities of a good citizen, although it is very hard to attain. On the quality of a good citizen, developing scientific reasoning and having critical thinking skills are not found in most of the population. To attain the digital citizenship, it is very optimistic to attain. Emphasis on nature of science and citizenship in schools at the secondary level.*

Expert 16 (Philosophy of Education): *I agree with all the statements, but in an ideal society. To attain these goals, it is not a realistic approach. Yes, we should always update our education skills. I surely believe that workshops and conferences will improve our teachers' abilities and skills. For primary schools, students should learn about civic education, as for middle schools, students should learn about civic education and legal studies. I hope that this ideal study could be adapted in our country, where we are facing reality with all its challenges.*

Expert 4 (General Education): *In general, I can say that's correct. If we are talking about the Lebanese curricula, they are outdated. But still the civics curriculum includes many components of citizenship. But not much about digital and global citizen. But at the Faculty of Education we have a course on citizenship education. If it's taught as it should, the students can benefit from it in their teaching and class activities. This is the experts' opinion but not everybody involved in education. Some people teach discrimination to their students. What can we say about them?*

Expert 5 (Early Childhood Education): *For Statement 7, I do not think there is a need to teach citizenship at the university level. Civil behavior is being taught in the early stages of education. I think it is appropriate for*

trainee teachers to know the laws related to their profession and their moral duties. As for topics to be included in the school curricula: Getting to know the idea of law. Why? (Topics in primary level), Identify the institutions that establish the laws and their functions (topics in middle school) and Citizenship and its relationship to laws, duties, ethics (topics in secondary level).

Expert 3 (Science Education): *For Statement 5, there is a need to link what is taking place at the school with the world outside the school for students to really understand the meaning of civic education. Even though interactive and inquiry learning are important, what is more important is how the ideas learned in school impact how students behave in real-life. Project based learning, service learning, team based learning and problem based learning (among many other similar experiential learning activities) are essential for students to develop civic responsibility.*

Expert 21 (Psychology): T*opics in primary level (learn about the national anthem; recognize the national flag, its colors and symbols; the national archeological monuments; the national customs and traditions; learn about the environment and conservation; the health rules and health behavior), topics in middle school (citizen's' rights and duties; social values, such as, cooperation, tolerance, respect ...; social responsibility; values of citizenship: national unity, environmental awareness, health awareness, economic awareness, political responsibility, social responsibility, belonging...; national belonging; freedom of expression; security and peace), topics in secondary level (national identity; democracy; discrimination; the individual's relationship with the state; State institutions; State authorities; Public ownership and private property).*

Conclusion

The aim of this study was to provide an expert view about a) the skills to be developed by science teachers in order to prepare future citizens, b) citizenship actual reality, challenges and perspectives in Lebanon and the Arab countries. Overall, educators emphasize on reforming school curricula, teaching methods and in-service teacher training programs. In addition, developing students' scientific reasoning and having a vast general culture, involve students in community service. Many educators emphasized on the role of the family, the school and the media. Experts underlined the importance to develop students' skills related to *science as a way of thinking* or the nature of science aspect of science literacy. Above all, many believed that there should be a focus on what actions this citizen takes rather than only what she/he believes in. Also, the experts have suggested topics in civic education through the school levels.

All experts agreed that because of receptive learning, civic education doesn't help in developing learner personality. Most agreed that we need interactive and active teaching strategies in order to better teach this discipline. And that student behavior reflects his family and society. All agreed that teacher preparation and intensive training programs for in-service teachers lack the development of teachers' skills related to citizenship and how they can include citizenship skills in their disciplines. Lebanese and Arab universities experts have a pessimistic view about civic education at school and university levels, teacher training programs and student practice. All experts agreed on the outdated curricula, and that Lebanese civic education curriculum does not include about citizenship and not about digital and global citizen too.

Finally, experts' opinions complemented each other and there were no controversies. All stressed on the diversity and the respect of the other. They refused any type of discrimination and fanaticism, to live in an open society where all are respected.

At the Faculty of Education, Lebanese University, the course citizenship education is currently a compulsory course and students in all majors, at the Faculty of Education, Lebanese University, who are attending this course in their last semester of their Bachelor degree. The course objectives are:
1. Instilling in student's consciousness the basic skills of citizenship education and contemporary democratic concepts and values of the civil society.
2. Interfering in civic education by activating the role of the school in developing a responsible and participating citizen.
3. Training to change the classroom into an interactive setting with students, to build for the culture of dialogue and independent and free decision-making attitudes, and to developing critical thinking skills. This study emphasized on the importance of students, at school and university levels, to take actively part in civic and societal tasks and not only to learn about theories about civic and citizenship duties and rights. Note that, this research is part of a larger project with the sample participants, undergraduate students and the training programs regarding citizenship education at the Faculty of Education.

This study reveals its importance, due to the followings:

1. The study sample is formed of Arab and Lebanese Experts in the field of Citizenship Education, science education and general education.
2. Contribution of this research in: a) making a repertoire of citizenship skills by Arab and Lebanese experts, b) assessing to improving the quality of the science courses that tackle the concept of Science Literacy in their syllabi and c) collect the needed students' science skills used for being an active citizen, from the point of view of the experts.

Recommendations and Limitations

Results of the present study match greatly with the Beirut conference on citizenship education. The study shows the actual situation of citizenship education from the Arab and Lebanese experts' points of views. It also reveals in details the realities, challenges and obstacles, as well as approaches to reach the goal of preparing a future Arab citizen, living in a modern society, where democracy, tolerance, diversity and welfare prevail.

The three-day conference on Citizenship in the Arab World ended with important recommendations, one of them is to activate research on citizenship education in universities and schools. Also, the recommendations highlighted the various presentations of ideas and proposals that developed the theme of the conference, where participants agreed that "the destiny of education is to build a rational citizen able to have attitudes and make decisions, and armed with a mind of critical knowledge ". Therefore, it is necessary to pay attention to the social, political and human values and concepts when developing the curricula of the faculties of education and to work towards the engraving of the concept and practice of democracy in the faculties of education. In a way, that the faculties of education in the Arab world would prepare to face the post-conflict phase that some Arab societies are living today, to activate the channels of dialogue, conferences and specialized research in citizenship education, to improve the common vision and create quality standards in order to improve the performance of these faculties and functions assigned to them, especially in terms of citizenship education, and to discuss the current situation and challenges faced by the Arab culture as a result of cultural invasion.
Future research on students, in the school and university levels and science and civic education teachers are encouraged.

The limitation of this study is that experts involved in this study do not reflect all the Arab experts' opinions, who participated to the Beirut Conference in 2014, because the sample is not representative of all the 22 Arab countries.

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