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USERS' SATISFACTION WITH REGARD TO TA'ASIYEDA INTERVENTION PROGRAM FOR PROMOTING TECHNOLOGICAL EDUCATION THROUGH COLLABORATION WITH THE INDUSTRY

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ABSTRACT. Israel, like many other countries worldwide, suffers from a lack of skilled human resources with technological qualifications. Ta'asiyeda, an association established by the Manufacturers' Association, has operated for the past 27 years an educational intervention program to promote students to technological routes and prepare them for the labor market by creating cooperation between the education sector, industry and employers.

A formative evaluation research was conducted using quantitative methods to identify the level of satisfaction with the intervention program expressed by principals, teachers and industry staff.

For this research, a new questionnaire was developed and validated and quantitative statistical data was collected from 222 participants (principals, teachers and industrialists) that participated in the Ta'asiyeda program.

The research results show that all program participants were equally satisfied with Ta'asiyeda's contribution with regard to the five aspects examined in the research: The collaboration between the industry and schools; Pedagogic components of the intervention program (knowledge, values and skills); The implementation process of this educational model in Israel; Students' motivation for technological education; Contribution to participants (from the education system and the industrial system).

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In comparisons conducted between the research populations, it was found that in the cases of significant differences, industrialists were more critical and less satisfied. With some aspects, respondents from high schools were less satisfied than respondents from junior high schools. And industrialists from the high-tech industry and from the low-tech industry ranked their satisfaction similarly and relatively high.

The research conducted proposes an effective optimal feasible model to help the organization make decisions leading to program improvement. The research conclusions can be adapted to other countries that cope with this issue of connecting education and industry for promoting and encouraging technological education in schools.

Key words: *Technological Education, Ta'asiyeda Educational intervention programs, increasing students' motivation, required skills*

Introduction

Israel like many other countries worldwide, suffers from the lack of skilled human resources with technological qualifications (Moshe in Israeli Knesset research and information center, 2016). Encouraging students to enroll in the technological route is a key to developing future human capital and continued growth of the industry, economy and the labor market (WEF, 2016). Yet, the future labor market presents many challenges to the education system. Technological swift changes and the digitalization revolution affects the world of professions, its structure and demands (Schleicher, 2017). Employers from many countries claim that they do not find candidates with the technological skills they need (Mourshed, Farrell, & Barton in McKinsey & Company, 2012).

It has been proven that effective collaboration between employers, trade unions, government and education can guarantee the education of generations that will successfully integrate into the economy and industry in a dynamic technological world (DEVCO, 2017). Despite the clear understanding that cooperation between the two systems is needed (Hanushek & Woessmann, 2017), a lack of communication was found between employers, students and education systems (McKinsey Center

for Government, 2014). This is probably due to the different goals, the different needs and the various methods of operation of the systems. Additionally, previous research had found different attitudes between employers and educators regarding the required skills for the future labor market (Dobbs, et al., 2012). Most employers are interested to recruit the best candidates and are interested in specific training for their companies and organizations (short-term immediate objective). Most educationalists focus on providing high quality and meaningful education (long-term objective), and producing graduates fitting for the future world (Smits, 2006).

To realize all these goals, and in light of the challenges in the field, many associations, funds and private companies together with governments have joined in this mission to contribute to promoting technological human capital through collaboration between industry and students from the education system (Musset, Kuczera & Field, 2014). For that purpose, they initiated and developed various models of intervention programs that are implemented in education systems in Israel and around the world.

The literature review had found models of intervention programs with different characteristics: (1) Belonging to different sectors of industry. (2) Belonging to different target audiences. (3) Providing different skills. (4) Promoting various subjects and areas towards industry.

The main theories and subjects on which these models are based are: increasing students' motivation for Technological Education (Flum & Kaplan, 2006; Deci & Ryan, 2000), constructivist learning (Mioduser & Santa Maria, 1995; Dressler, Sela & Mazor, 2014; Kolb, 1983). And imparting required skills and qualifications for technological education (McKinsey Center for Government, 2014; OECD, 2014; Brender, 2017).

It can be stated that these private educational initiatives models arouse the students' excitement, a desire to learn, enjoyment and experiences (Quintero, 2016). However, there is no follow-up study or assessment of their effectiveness in the short and long-term, and what works best (Rama, 2019; Szold Institute (2019). Many policy and decision-makers are discussing and seeking the most effective model on this subject.

Ta'asiyeda is one of the largest educational intervention programs in Israel which links the world of education to that of industry (Ta'asiyeda, 2018[2]).

Ta'asiyeda promotes technological education and integrates all of the characteristics of the aforementioned models.

Ta'asiyeda is an educational association established 27 years ago by the Manufacturers Association. The association implements a variety of educational programs in the field of technology in cooperation with the industrial world.

Ta'asiyeda implements a unique educational model that integrated into each school's curriculum, to encourage students' motivation to study technology. It operates among 300,000 students a year throughout the country, gathering students who are Jews, Arab and Druze, religious and secular from kindergarten to high school with hundreds of companies and organizations

In my role as the director of the Ta'asiyeda association for the past 13 years, I have chosen to conduct this research as it is important for me and the organization's management to explore what partners' attitudes are and their satisfaction with Ta'asiyeda's programs. Additionally, it is important for me to know whether it is a successful effective intervention program for promoting technological education that meets the challenges raised in Israel and around the world in the current era; for example, shortage of qualified human capital in the field of technology, cooperation between the systems, a lack of communication between personnel from the educational and industrial systems. Industrialists disagree with regard to what skills should be instilled in students to create technological human capital, which makes it harder to develop a suitable curriculum.

In the literature review conducted, no similar intervention program was found and no evaluation research has been conducted about Ta'asiyeda's model.

[2] According to Ta'asiyeda reports: published by the Associations' Registry and the Ministry of Justice and the Association's website (2018). https://he-il.facebook.com/Taasiyeda

Research Aims

1. To build, develop and validate a new questionnaire based on survey instruments which examine satisfaction aspects from Ta'asiyeda Program
2. To identify the level of satisfaction from Ta'asiyeda intervention program expressed by different program partners: principals, teachers and industry staff.

Research Variables

Dependent Variables:

Satisfaction levels regarding the success of the intervention education program, in 5 aspects:

1. The collaboration between the industry and schools
2. Pedagogic components of the intervention program (knowledge, values and skills)
3. The implementation process of this educational model in Israel
4. Students' motivation for technological education
5. Contribution and impact of the intervention education program on the participants from the education sector and the industrial sector

Independent Variables:

1. Type of population (industrialists, school principals, leading teachers).
2. School Level (junior high school, high school).
3. High tech (IT industry) and low-tech companies (production industry).

Research Questions

1. To what extent do educators and industrialists share common satisfaction from promoting and encouraging technological education in Ta'asiyeda program?

2. What are the differences between educators and industrialists in their satisfaction levels from Ta'asiyeda program in the five aspects: The collaboration between the industry and schools, pedagogic components of the intervention program (knowledge, values and skills), the implementation process of this educational model in Israel, students' motivation for technological education, and contribution to participants (from the education system and the industrial system).

3. What aspects have been evaluated as a success of Ta'asiyeda intervention program and which are more important than others?

4. What are the differences in satisfaction levels with Ta'asiyeda program across the following groups:

a. Leading Teachers versus Principals

b. High schools versus Junior High Schools

c. High tech industry versus Low-tech industry

Research Design

A previous stage in research was required in order to develop the questionnaire examining satisfaction with the Ta'asiyeda program. Findings from a qualitative research served to develop the questionnaire, which was then distributed among the sample respondents in the quantitative research part and supported the ability to create new research questions and directions.

In the design of the research, we built a one-way comparison between industry versus education, which are then ranked across the three major types of participants: industrialists, school principals and leading teachers. Next, the nested comparisons are within the education sector (types of schools, types of participants), and within the industrial sector (High-Tech versus low tech). In the education sector an interaction between types of schools and types of respondents (two-way Analysis of Variance) was tested.

The research consisted of three stages:

Stage 1: **Expert validation of the questionnaire -** The questionnaire that assessed the satisfaction level from the intervention program and its impact by industrialists and educators, was built and validated.

The first stage was to check validation among six experts-to examine to what extent questionnaire statements indeed represented what they wanted to measure.

Experts were highly consistent with their evaluation of the questionnaire across the five aspects; High means and low standard deviations, and high level of internal consistency (α>.72)

Stages 2: **A pilot survey** for checking the questionnaire reliability - A pilot with 40 participants (leading teachers, school principals and industrialists) was conducted to test questions and participants' comprehension. Respondents were asked to address every question and assess it according to a Likert scale (Likert, 1932). Means, standard deviations, range and Cronbach alpha internal consistency reliability values were calculated for the five aspects measured in the questionnaire.

It was found that there was a high level of agreement regarding the statements that measure the 5 aspects. The grades were higher than 3.75 on a five Likert point scale. The Cronbach alpha of each of the five aspects are high (α > .70) and even very high in four of the five aspects (α > .90).

After completing the questionnaire, they responded to questions about the clarity of the questionnaire (Marom, Gordoni & Zemach, 2009). For all these questions, the means was above 4.30 out of scale of 5 points, which testify to a high level of agreement with the degree of clarity and understanding of the questionnaire.

Stage 3: Identifying the level of satisfaction from Ta'asiyeda intervention program expressed by different program partners: principals, teachers and industry staff – administering the questionnaires developed for this research to Ta'asiyeda program participants.

Participants

The research participants consisted of 222 participants -81 school principals (36.5%), 100 leading teachers (%45) and 41 industrialists (18.5%), The sample represents principals and teachers all over the country, and industrialists in whose industries Ta'asiyeda activities were implemented.

The questionnaire was distributed to participants in 3 Ta'asiyeda programs:

1. Smart City - in junior high schools (pupils aged 12 – 15);
2. Technological Entrepreneurship Premium - in junior high schools;
3. Experience in Industry provided on the technological route- in highschools (pupils aged 15 – 18).

Research Results

Table 1 presents Findings Pertaining to Research question 1

To what extent do educators and industrialists share common satisfaction from promoting and encouraging technological education?

Table 1. Means, standard deviations calculated regarding the five aspects in the questionnaire evaluating the Ta'asiyeda program

Five aspects in questionnaire evaluating Ta'asiyeda program	M	SD	Range
The collaboration between the industry and schools	4.37	0.46	2.89-5.00
Pedagogic components of the intervention program (knowledge, values and skills).	4.04	0.63	1.69-5.00
The implementation process of this educational model in Israel.			
Expressed program features	3.85	0.75	1.40-5.00
Expressed teaching methods	3.70	0.93	1.20-5.00
Satisfaction with teaching methods	3.67	0.95	1.00-5.00
Students' motivation for technological education	4.02	0.82	1.00-5.00
Contribution and impact of the intervention education program on the participants (from the education system and the industrial system).			
Contribution to industry	3.83	0.73	2.40-5.00
Contribution to students	4.18	0.68	1.75-5.00
Contribution to schools	3.90	0.88	1.33-5.00

Table 1 shows that Satisfaction among all respondents was high in all aspects**:** Mean ranged from 3.67 to as high as 4.40 with standard deviation which was not higher than 0.97.

The aspect which shows the highest satisfaction among partners was collaboration between the industry and schools.

The aspect which shows the lowest satisfaction among partners was the implementation process of this educational model in Israel.

Satisfaction with each aspect was examined with all partners: industrialists, school principals and teachers. The findings are presented in Figures 1 – 5..4

Satisfaction Aspect 1 – The collaboration between the industry and schools

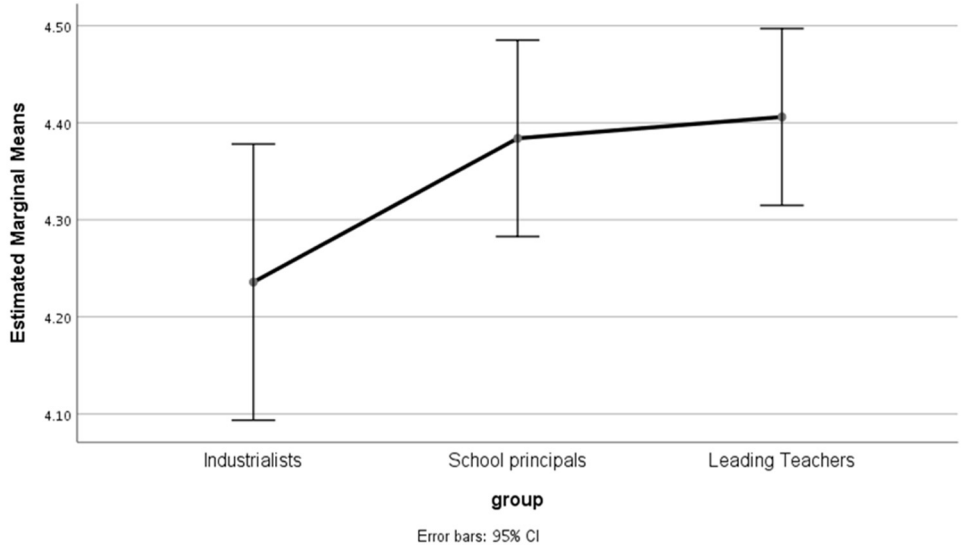

Figure 1. The collaboration between the industry and schools

Looking at the level of the means shows that all three research populations testified to a high level of agreement that the Ta'asiyeda program works to collaboration between the industry and schools (Score over 4 on a scale of 1-5).

No significant difference between industrialists and educators was found: F=2.06, p=.130; t=-2.01, p=.046

Satisfaction Aspect 2 – Pedagogic components of the intervention program (knowledge, values, skills)

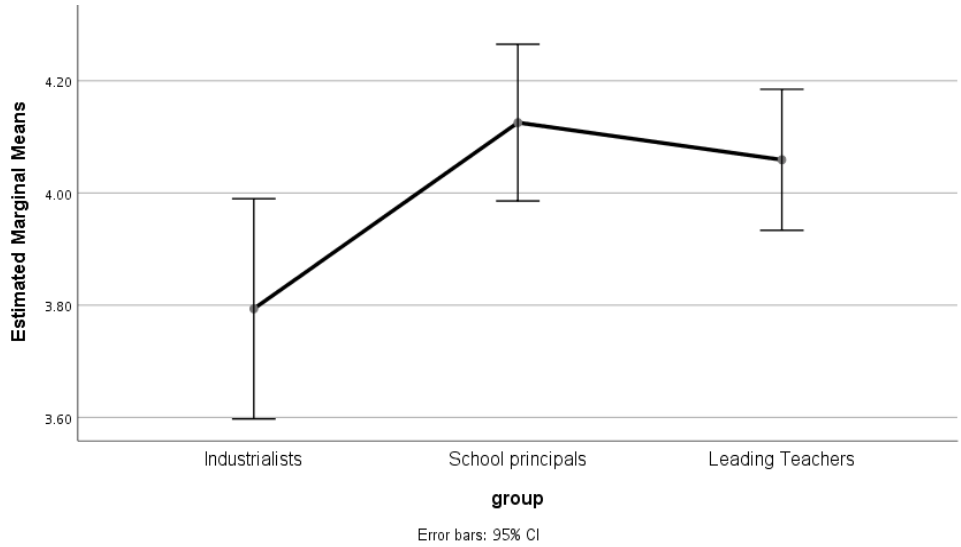

Figure 2. Pedagogic components of the intervention program (knowledge, values, skills)

Looking at the high means reveals that all three research populations testified to the fact that they are satisfied with the principle that the program's pedagogic components were expressed in it (rated over 3.8 on a scale of 1-5).

Overall significant difference was found F=3.83, p=.023.

Industrialists ranked pedagogic factor lower than Principals (p=.021), but leading teachers did not differ from both groups.

Satisfaction Aspect 3 – The implementation process of Ta'asiyeda educational program in Israel

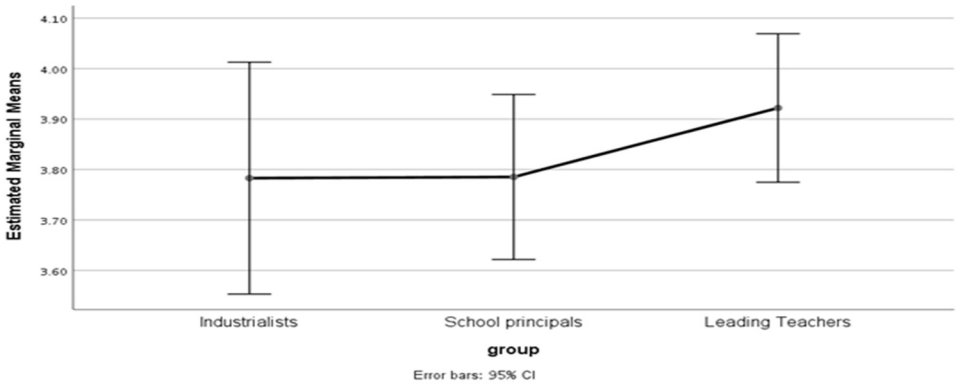

Figure 3.1. Expressed program features

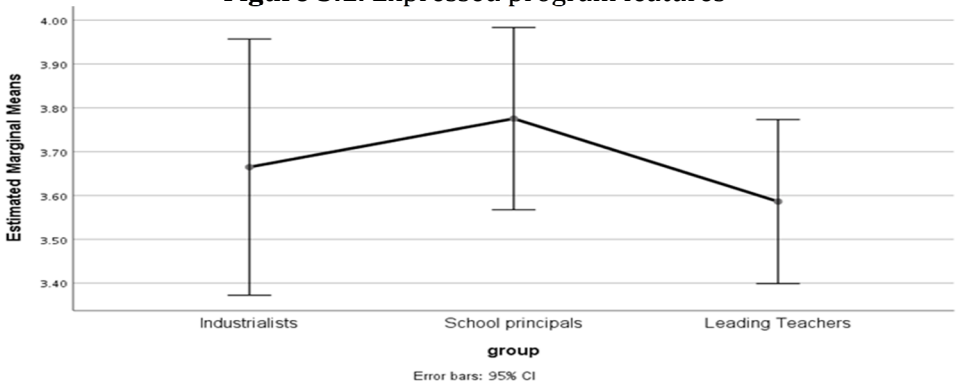

Figure 3.2. Satisfaction with teaching methods

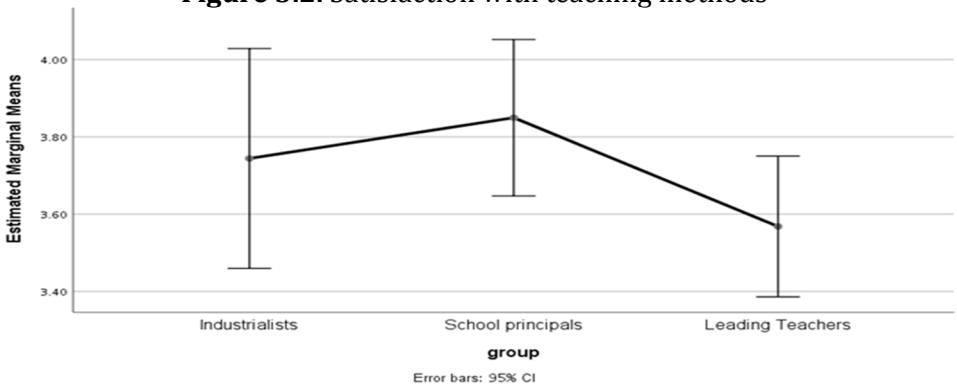

Figure 3.3. Expressed teaching methods

The dependent variables were the extent to which program features are expressed, the extent to which teaching methods are expressed and levels of satisfaction with the program's teaching methods.

There was no significant difference between the group assessments on levels of agreement that program features indeed are expressed, $F(2,219) = .93$, $p = .39$, $\eta_p^2 = .01$.; on levels of agreement that its teaching methods are indeed expressed, $F(2,219) = 2.12$, $p = .02$, $\eta_p^2 = .02$; and levels of satisfaction with the program's teaching methods, $F(2,219) = .89$, $p = .41$, $\eta_p^2 = .01$.

Satisfaction Aspect 4 – Students' motivation for technological education

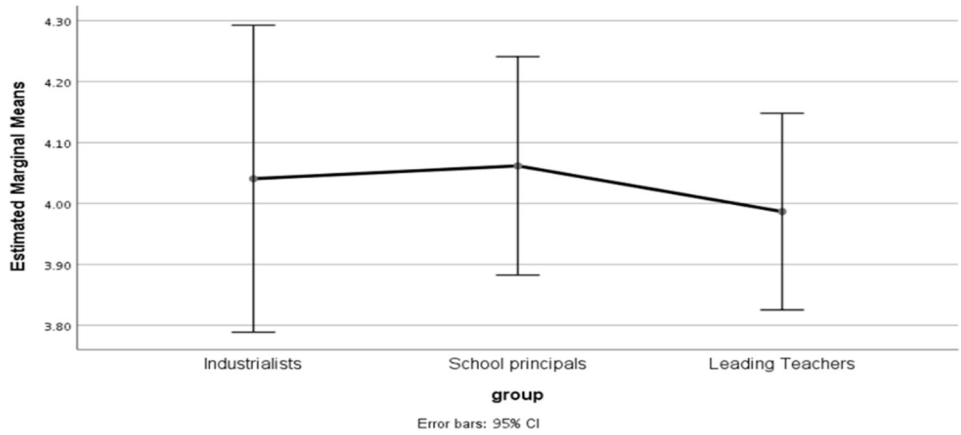

Figure 4. Students' motivation for technological education

Looking at the means reveals that all three populations testified to a high level of agreement that the Ta'asiyeda program increases motivation for technological education among students studying on it (above 3.99 on a scale of 1-5).

All groups agreed that the program generated motivation in students, although the distribution among industrialists was higher than the distribution among educators It was found that there are no differences between industrialists and educators populations regarding the extent to which they perceive that Ta'asiyeda program is increasing motivation F=0.20, p=.820.

Satisfaction Aspect 5- Contribution and impact of the intervention education program on the participants from the education sector and the industrial sector

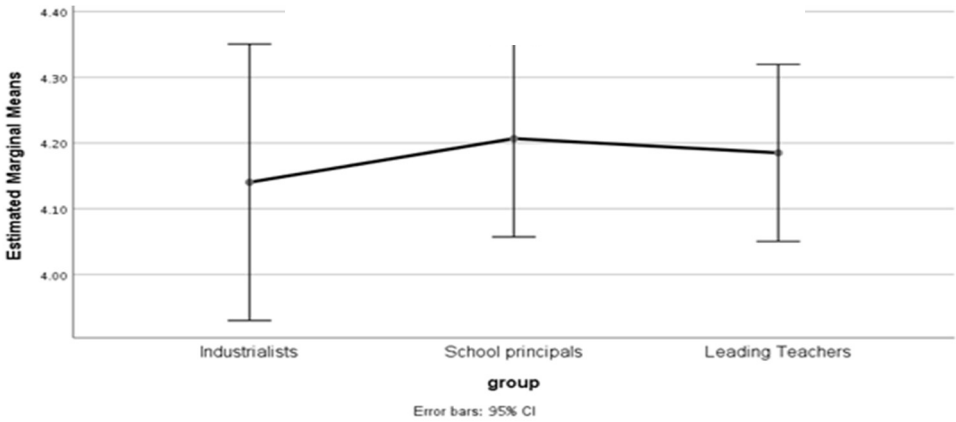

Figure 5.1. Contribution to Students

Looking at the means, testifies to the fact that all three research populations showed a high level of agreement with regard to the Ta'asiyeda program's contribution to students studying on it (Above 4.14 on a scale of 1-5). It was found that there were no differences between research populations regarding contribution to students $F(2,219) = .13$, $p = .88$, $\eta p2 = .00$.

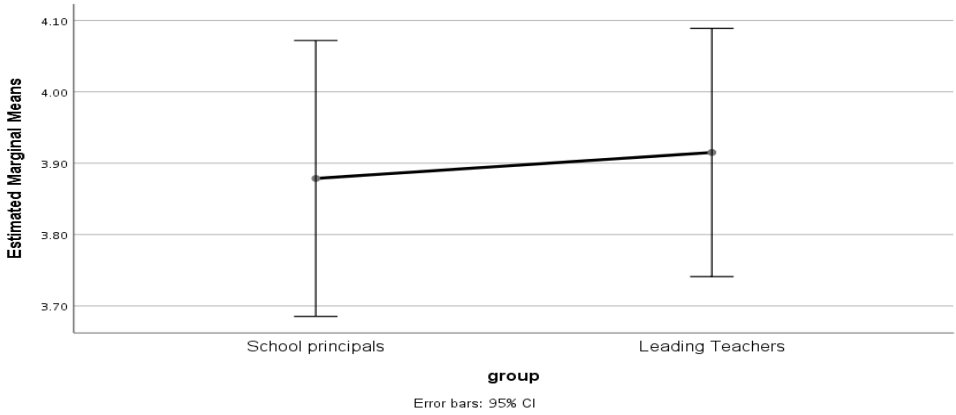

Figure 5.2. Contribution to Schools

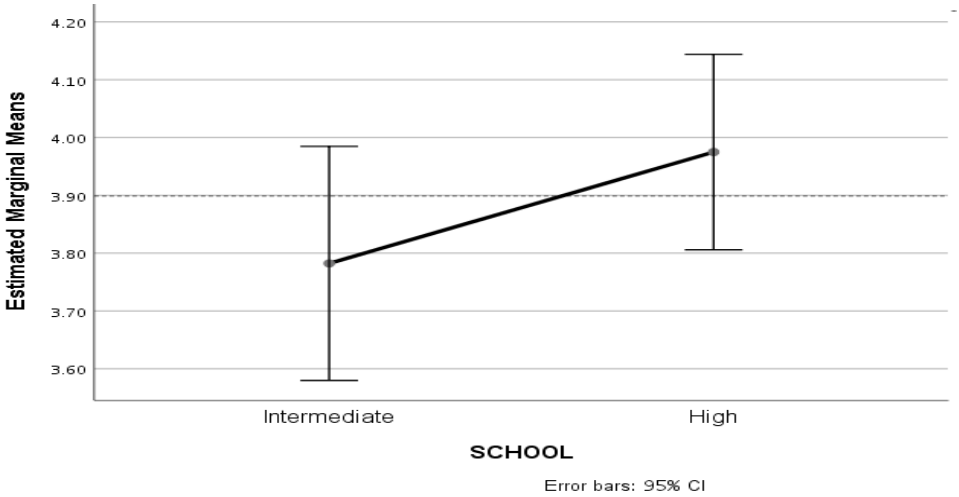

Figure 5.3. Contribution to Schools

Looking at the means testifies that both educational research populations showed a high level of agreement that the Ta'asiyeda program contributes to schools in which it operates (Above 3.88 on a scale of 1-5). There were no differences between the participants: Role: F=0.08, p=.783; Schools: F=2.08, p=.151; Interaction: F=0.45, p=.505.

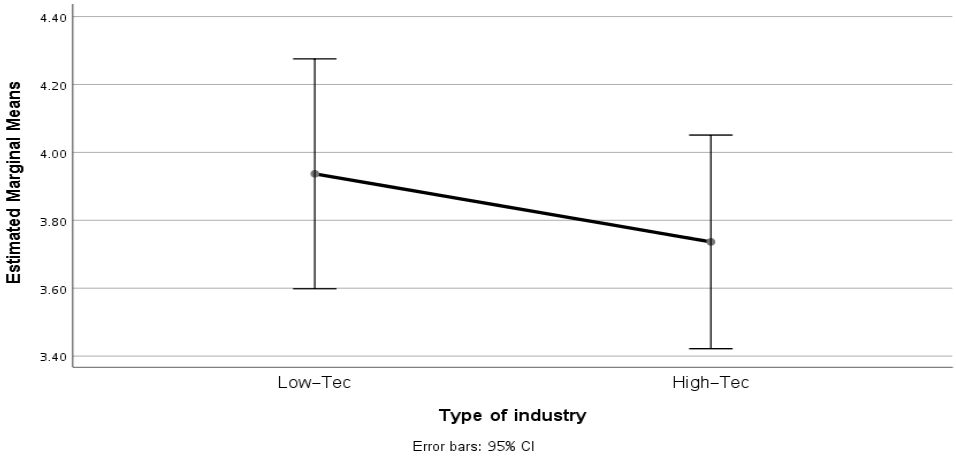

Figure 5.4. Contribution to Industry

Only industrialists were asked about the Ta'asiyeda program's contribution to industry as for providing an answer to the need for future workers, possibility to contribute to the community, create a regular link with the education sector, ability to influence the future generation and create pride in their factories It can be seen that industrialists see a significant contribution to industry in the Ta'asiyeda program. There was no difference in satisfaction between industrials from low-tec or high tec industries (F=0.77, p=.386)**.**

The research also examined the differences in satisfaction levels with Ta'asiyeda program across the following groups:

a. Leading Teachers versus Principals
b. High schools versus Junior High Schools
c. High tech industry versus Low-tech industry

The main findings arising from the analysis were:

- No difference was found between leading teachers and principals
- Respondents from high schools were less satisfied than respondents from junior high schools in the following aspects: pedagogic components; values and skills; teaching methods; but were higher only on motivation aspect
- Across all aspects of satisfaction, respondents from the high-tech industry did not show significant difference in comparison to respondents from the low-tech industry. Both industrial sectors ranked their satisfaction similarly and relatively high.

Discussion

The discussion addressed each of the Ta'asiyeda program aspects examined in this research

A. The collaboration between the industry and schools

The research findings revealed high means, expressing all research populations' high level of agreement that the Ta'asiyeda program indeed

expresses and contributes to strengthening links between industry and the education sector. It is important to emphasize that this aspect of strengthening links between industry and the education sector scored the highest mean of all the aspects examined with research participants. Throughout this research from its start, much was said about the necessity of the link needed between industry and the education sector to promote technological human capital (WEF, 2016). Nonetheless and despite the links needed between sectors, many studies conducted around the world have proven that these sectors do not cooperate with each other and there are huge gaps in satisfaction between them (McKinsey Center for Government, 2014). This research, conducted with three populations, similar to those used in studies carried out around the world (industrialists and education sector personnel – school principals and lead teachers) proved that within the Ta'asiyeda framework cooperation exists and there is a high level of links.

The findings add to existing literature in that it is possible to strengthen links between schools and industry through a body that serves as an integrator who is attentive to both sectors needs.

B. Pedagogic components of the intervention program (knowledge, values and skills).

Research findings revealed high means testifying to all participants' level of agreement that the Ta'asiyeda program indeed works to instill values, skills and innovative, enriching knowledge relevant to students' world.

His finding proves that the Ta'asiyeda program provides a response satisfying diverse industrialists' needs and those of the education sector and the different approaches existing in each sector on these issues .

Nonetheless school principals expressed significantly higher agreement in comparison with industrialists. A possible explanation for this finding can be ascribed to the involvement and level of interest of educational personnel that comes from their occupation in a known field that is more relevant to their world. In contrast to industrialists who contribute to this issue, but whose knowledge and understanding of the pedagogical field is less because it is not their primary occupation.

These results expand on research literature about way to instill a range of skills, qualifications, knowledge and values through industry so as to prepare students for their future.

C. The implementation process of this Ta'asiyeda educational program in Israel

Examining the findings presented, there was a high level of agreement that the Ta'asiyeda program indeed operates according to the features and teaching methods it defines resulting in a high degree of satisfaction among the research participants.

The range of statements characterizing activities in the Ta'asiyeda program allows schools and companies to choose and adapt the model, according to their existing abilities, needs and limitations (Adler, 2010; Remillard, 2016). Industry is also interested in choosing a model that suits them, their abilities, possibilities, level of their staff interest, level of their personnel's volunteering, company size and vision about this issue (Kuczera et al., 2018). It appears that because they have the option to choose a suitable model, it is possible to recruit a large number of companies to the Ta'asiyeda program.

Program activities are founded on "teaching methods" detailed in a range of participants' statements, all congruent with the constructivist theory. As defined in research literature (Kromholtz, 2013), such programs contribute to students' enthusiasm, interest, curiosity and motivation to learn and has proven itself as efficient in the Ta'asiyeda program. On this issue too, findings expand knowledge about ways of teaching/learning in the constructivist method through industry outside school walls and contributes to a high level of satisfaction among those participating in the program.

D. Students' motivation for technological education

Average mean scores were found high among all research populations, testifying to a high level of agreement that the Ta'asiyeda program indeed works to increase motivation for technological education among participating students.

Three dimensions of increasing motivation were explored – motivation to learn per se, motivation to learn technology as a subject and motivation to be directed to choose the technological route. It was found that the mean score for extent of agreement that Ta'asiyeda acts to increase motivation to study technology was higher than increasing motivation to learn per se and increasing motivation for the technological route.

Nonetheless, this study emphasized differences existing between populations in the education sector on the subject of *motivation to choose the technological route*. Many educational personnel teaching in junior high school (mainly educational personnel concerned with general areas) views directing students to the technological route as negative, with a low image, or time of tracking, as Barak (2014) found. Nevertheless, this does not prevent educational personnel in junior high schools from participating in Ta'asiyeda programs with a purpose of increasing motivation for the technological world as a means of developing multiple intelligences and getting to know the real world that actually presents technological progress (Director General's Directive, Ministry of Education, 2000).

Apparently, the differences in understanding the meaning of the concepts: (1) motivation for technological education, (2) motivation for exposure to the technological world, and (3) motivation for the technological route is what lead to the differences in program participants' perceptions.

E. Contribution and impact of the intervention education program on the participants (from the education sector and the industrial sector)

It can be seen that the extent of each research population's perception of the program's contribution was high and there are no differences between the three research populations with regard to the level of their agreement. Looking at the means scores of the contribution measures of each research population revealed that contribution to students was perceived as greater than contribution to schools or industry.

Industrialists view a high contribution to industry as a result of their participation in the Ta'asiyeda program. This is surprising given the fact that Industrial companies have many goals for joining the Ta'asiyeda program. One of these is the easily train students for future worker recruitment purposes (Mühlemann, 2016). Another purpose is to prepare the younger generation for the future technological world, whilst another is based on marketing interests and contribution to community (OECD, 2010).

From the range of statement presented to industrialists about contribution, the possibility to contribute to community scored the highest mean of all statements

IAs for the program contribution to students, the mean for the statement of exposing students to the real world was higher than other measurements. The importance of this statement was remarkable among all examined populations (McKinsey Center for Government, 2014).

In the context of findings presented by education sector personnel-schools benefit from a contribution in various areas that are important to management teams, and for reasons that are not always linked to technological education

The research findings prove that it is possible to carry out a program of cooperation between different sectors and to make each sector feel that they are benefitting from the program greatly. This is in contrast to studies reported in the literary review that presented the differences between the education and industrial sectors, in different goals, needs and interests, different budget, and there are also differences within each sector in their approaches (McKinsey Center for Government, 2014).

Research Limitations

- One of the research limitations is linked to the researcher's position. The research was headed by the program director, who led the research as a whole and its directions and thoughts that had been assimilated personally over years by virtue of her role in the organization. Awareness of this limitation led the researcher to neutralizing the effect of all this on the research writing process.

- This is an evaluation research about the Ta'asiyeda programs without a control group of participants who participated in other programs. Nevertheless, to neutralize this limitation, the research included several populations that participated in diverse Ta'asiyeda programs, at a wide range of roles.
- The research focused on the perceptions and satisfactions of teachers and principals from the education system and industrialists from High-tech and low-tech industries. This year, the Ministry of Education is conducting a parallel research addressing the program's contribution to students.

Conclusions - Research Contribution to Existing Knowledge

The current research is the first applicable evaluation research conducted in Israel with regard to the Ta'asiyeda intervention program. The research examined and addressed all program participants: school principals, leading teachers from junior high and high schools and industrialists from various low-tech and high-tech industries.

The research findings shed light upon Ta'asiyeda program's contribution to the creation and strengthening the link between the education system and industry, exposing students to the world of the future and increasing their motivation to learn and engage in the rapidly developing field of technology.

The main conclusion is that all program partners benefit from it and are greatly satisfied with all five aspects of the program examined in this research. The research findings also strengthen the rationale of the Ta'asiyeda program, which is implemented within schools as well as activities that take place outside schools such as visits to industry, working on projects in industry, lectures and encounters with professionals from the industry.

The pedagogical activity model applied in the Ta'asiyeda program is carried out through innovative, advanced and relevant industry and its personnel. It is actually the essential difference to all other pedagogical programs existing in schools, and contributes to high levels of satisfaction.

The research also has a methodological contribution - the elaboration and validation of a new questionnaire for assessing the industrialists' and educators' level of satisfaction with Ta'asiyeda intervention program**.** This questionnaire can also be used in other countries and cultures.

It is important to expand this research in the future, to research in which a control group of people who do not participate in the Ta'asiyeda program, or people who participate in other, similar programs or with a population who participate both in the Ta'asiyeda program and other similar programs. Such studies will explore the same aspects examined in this study.

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