

**Insiders' Perspectives on Project Based Learning:  
A Comparison of US and Israeli Approaches**

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**Abstract**

*High school students and teachers in two countries (US and Israel) were interviewed to ascertain their perspectives about their Project Based Learning (PBL) experiences. Perspectives were evaluated to determine to what degree PBL approaches were based on the eight essential elements of PBL and whether PBL courses contributed effectively to workplace preparedness. Differences between teachers and students and between countries were identified. Results revealed that PBL programs incorporating the eight essential elements are more effective in preparing students to enter today's work environment. Students perceive stronger benefits from their PBL experiences than teachers perceive. Additionally, the perspectives of Israeli teachers and students were more similar to each other than the perspectives of US teachers and students.*

**Keywords:** Project Based Learning; progressive education; Israel and United States; qualitative research

**Introduction**

Educational institutions across the globe are adopting new pedagogies with the intention of better preparing the next generation of business employees and combating the dissatisfaction of businesses hiring business major graduates (Ravitz, 2008; Weisblat & Bresciani, 2012). These pedagogies, coined "progressive," are meant to develop the skills, not just the knowledge, employees require to keep a business afloat in today's global market (Ravitz, 2008; Cernavskis, 2015). In a global market that is constantly evolving, employers are looking for people whose abilities transcend rote memorization of facts and the completion of monotonous assignments (Seeley, 2009; Cernavskis, 2015). Therefore, we ask the question, "Are these pedagogies living up to their claims?"

One reason for the rise in popularity of progressive pedagogies is that they develop the skills most valuable in primarily entrepreneurial firms inside and outside of the United States (Römer-Paakkanen & Takanen-Körperich, 2011). Among these valued skills are technological savviness, creativity, critical thinking, communication, and innovation (the heart and soul of new businesses). Small

and medium enterprises (SMEs), an example of predominantly entrepreneurial firms, make up 99.7% of all employer firms in both the United States and Israel (Rothwell & Zegveld, 1982; Small Business Act Fact Sheet, 2013; Small Business Facts, 2011). These firms are also significant in hiring, employing half (50%) of the private sector working population of the United States and over half (66.5%) of the private sector working population of Israel (Small Business Act Fact Sheet, 2013; Statistics about Business Size, 2008; Firoozmand et al., 2015).

In countries like the United States and Israel, SMEs are regarded as the epitome of the free market, generating the most radical innovations and requiring entrepreneurial inclinations on the part of the workers in order to succeed in the business (Rothwell & Zegveld, 1982). With such a large proportion of workers entering the business field and working in SMEs in particular, entrepreneurial learning approaches need to be implemented so that high employment and innovation needs can be met (Westerholm, 2010). A study by Slepcevic-Zach, Wimmer, Stock, and Paechter (2015) of two vocational schools in Austria demonstrated that hands-on experiences increase students' professionalism and teamwork, therefore better preparing them to function in the outside world. Pedagogies whose values are in line with those of entrepreneurial institutions include in their curriculum an emphasis on presentation, fluency with technology, skills that assist with self-directed learning, and team skills (Baker, 2007; Riebenbauer & Slepcevic-Zach, 2013). These institutions develop their students' readiness for the workforce.

One such pedagogy is Project Based Learning (PBL), which is characterized by its emphasis on both the learning and application of the content in a context that empowers the students to apply it (Stock, Riebenbauer & Winklebauer, 2010; Thomas, 2000). This approach is accomplished by implementing projects into the curriculum, meaning that there is a measurable output which demonstrates competency in subject areas. These projects can be anything from small, one-day activities to large, interdisciplinary, semester-long products that incorporate design, revision, and exhibition of the final product (Blumenfeld et al., 1991). The essence of this pedagogy can be traced as far back as Socrates, who required his students to question their surroundings and think critically (Boss, 2011; Hanney & Savin-Baden, 2013). John Dewey, an unknowing proponent of PBL, fought for an educational system that more closely resembled the "real world" through the use of engaging experiences and learning of skills that help students cope with an ever-changing world (Boss, 2011; Coffey, 2008). Other famous names in education, that together defined the progressivist movement that fostered PBL, include Francis Parker, Maria Montessori, and Jean Piaget, among others (Boss, 2011; Peterson, 2012).

The ideals of the progressivist movement culminated in a book called *The Project Method*, written by William Heard Kilpatrick (1918). This book served as the catalyst for project modulated education that was eventually coined project-based learning (Peterson, 2012; Stock, Riebenbauer, & Winklebauer, 2010). Kilpatrick's theories were further developed by the Buck Institute of Education (BIE) to derive the Eight Essential Elements (Table 1), which serve as the guideline for what must be present in a meaningful project (Larmer & Mergendoller, 2010).

Table 1

*Eight Essential Elements of Successful Projects*

Essential Element	Description - Successful academic projects should:
1. Significant Content	incorporate concepts directly related to the core of the academic subject extend beyond academic subject to address other knowledge and skills needed by students
2. 21st Century Skills	require teamwork strengthen critical thinking skills require problem solving encourage higher-order thinking encourage creativity and idea expression
3. In-Depth Inquiry	require rigorous research encourage questions to be asked require identification and use of appropriate resources necessitate that students answer challenging questions
4. Driving Question	use open-ended questions to guide students through the project use questions to focus work and deepen learning use questions to frame issues logically for students
5. Need to Know	culminate in a final product that creates the context for learning content facilitate students' understanding of the need to gain knowledge and skills in order to complete the project
6. Voice and Choice	allow students to have a say in some aspects of project students have opportunity to make decisions
7. Revision and Reflection	provide appropriate feedback/critiques of interim work product allow students to respond to feedback by revising and resubmitting encourage high-quality discussions among students to facilitate metacognitive understanding
8. Public Audience	provide the opportunity for formal presentation of work product to external stakeholders capitalize on using external audiences to increase student motivation and project authenticity

*Adapted from Buck Institute of Education (Larmer & Mergendoller, 2010).*

In May of 2015, the BIE unveiled a revision to the original theoretical framework. This new, research-based revision is called Gold Standard PBL and is split into two major components: Essential

Project Design Elements and Project Based Teaching Practices (Larmer & Mergendoller, 2015). The Essential Project Design Elements consist of the important factors to consider when designing a project and greatly resemble the Eight Essential Elements described in Table 1 (Larmer & Mergendoller, 2015). The Project Based Teaching Practices highlight the instructional and cultural changes that are required to transition from a traditional to a progressive classroom (Larmer & Mergendoller, 2015). Because Gold Standard PBL was released after the data collection and analysis were completed for this study, this framework was not used for this study.

However, there are concerns that PBL is not universally applicable. Because the definition of a project is so broad, teachers are offered little to no support at its inception, and how PBL is defined and implemented varies from school to school and country to country (Hanney & Savin-Baden, 2013). In application, projects require that the subject matter allows for creativity and hands-on activity. Therefore, subjects that rely more heavily on teacher-led instruction may not be as capable of producing an engaging or relevant project (Hanney & Savin-Baden, 2013; Thomas, 2000).

### **Purpose of Study**

The researchers ask the question, “What is the insider’s perception of project-based learning?” in order to find out if students and teachers feel that this pedagogy adequately prepares students for the business and job world by adhering to the Eight Essential Elements of PBL (Table 1). By interviewing students and teachers in two schools currently implementing PBL, we were able to compare different experiences. From this comparison, we developed an understanding of the strengths and weaknesses in the implementation of the pedagogy, particularly in the individual schools and preparing students for the workforce.

The purpose of the study was to explore whether institutions implementing project-based learning (PBL) are upholding the “eight essential elements” and preparing students for the workforce from the point-of-view of those learning and teaching within these institutions. Additionally, this study set out to understand how the perceptions of teachers and students within a school differ, as well as how the perceptions of students and teachers between the two countries compare.

### **Methodology**

Since the basics of this research hinged on the perceptions of the participants about their PBL experiences, we used interview methodology for data collection. Semi-structured interview questions were utilized.

After several readings, the interview notes were organized by interview question and their relevance to the respective essential elements. From these organized data, a chart was created that allowed for side-by-side comparisons of students, teachers, and schools (Table 2). Observations made using these data were used to create Table 3, which ranks students’ and teachers’ perceptions of the implementation of the essential elements at their respective schools. Responses that were related to

the perception of student readiness for the workforce were ranked and displayed in Table 4. The results from Table 3 and Table 4 were then summarized in Figure 1, which displays both the perception of adherence to the eight elements and students' readiness for the workforce.

The schools selected for this study were The Gary and Jerri-Ann Jacobs High Tech High (HTH) in San Diego, California, USA and Mevo'ot HaNegev (MHN) in Kibbutz Shuval, Israel. Both schools exist in countries where entrepreneurial and professional business skills are greatly valued, and both schools are public high schools that implement projects into their curriculum. Because these two schools share similar teaching philosophies and practices, seek to prepare their students to function in entrepreneurial environments, and are located in highly entrepreneurial countries, these schools were ideal for a comparative analysis of their students' and teachers' perceptions of their PBL experiences.

### **Data Collection**

Interview methodology was used to collect data. Both the student and teacher interviews were divided into two parts. The first part inquired about the PBL environment established by the school. These questions were derived primarily from those raised by Blumenfeld, et al. (1991) in their article "Motivating project-based learning: Sustaining the doing, supporting the learning." The second part of the interview required participants to provide in-depth descriptions of one project in which they had participated and to answer questions that would shed some light on whether or not the project possessed all eight essential elements. The interview questionnaires were pre-tested with one teacher and one student to assure that the interviewer was receiving relevant data and the participant was clear on what was being asked of him or her. The questions were then modified based on the comments made by the test subjects.

Because this study had the objective of evaluating PBL from the perspective of the participants (students and teachers), it was important that the participants represented a range of experiences and expertise. For this reason, administrators at each institution were asked to nominate faculty participants who represented high, medium, and low levels of experience with PBL and student participants who represented different levels of PBL performance. Three teachers and eight students from each high school were interviewed. The teacher and student lists provided by the administration contained more than the minimum number of participants at each school in case any participants withdrew during the study. To assure that no gender biases might affect the results an equal number of males and females (students and teachers) were interviewed.

All interviews were conducted on the school campus, in privacy, and in the native tongue of the individual being interviewed. Interviews were conducted at the convenience of the participant and in a conversational-type manner. Each interview was recorded and averaged 40 minutes. The author did not take any notes while recording. Once all interviews were completed, the recordings were transcribed verbatim, only omitting stutters, "uhms" and "ehs".

## Data Analysis

The interviews were analyzed in a style referred to as Framework Analysis, in which the data collected already corresponds to a given framework (Lacey & Luff, 2001). For this study, the interviews were analyzed in the context of the eight essential elements. The data analysis process included familiarizing ourselves with the raw data, organizing it into responses to similar questions and questions that correspond to the same essential element, structuring that data into comprehensive charts, comparing our approach with accepted approaches, and sharing our findings with representatives from our pool of participants.

During the first step, familiarization, the transcribed interviews were reread. As the interviews were being read, spelling errors were corrected and the documents were reformatted to improve readability. To increase the reliability of the subsequent analyses, the interview results were refined and reduced to include only those questions for which at least 80% of the participants had responded. In addition, during this first step some initial classification of the questions took place and a data analysis journal to document the process was begun.

The second step (coding) required the categorization of responses by survey question and sub-categorization by the eight essential elements. Each group of participants (students and teachers) within each school was coded separately, resulting in four groups of data. The data were then re-examined and generalized to encompass more of the participants' perceptions. After several iterations of re-examination, the general observations of the eight essential elements in each school became apparent.

Step three (charting) was comprised of two parts: 1) data organization to allow for side-by-side comparisons between teachers and students by country and 2) data interpretation to facilitate an assessment of PBL effectiveness. Table 2 contains the summarized responses to the interview questions, categorized by group. Each row represents an essential element. Most elements required more than one question to capture the element. The rows within the essential elements represent responses to different questions relating to that essential element. Because the teachers tended to give lengthier answers to questions, the teachers, on the whole, answered fewer questions than the students, hence the blank boxes under the teacher columns.

The second part of the charting step utilized the side-by-side comparisons of the responses from Table 2 to create a diagram identifying the perceived impacts of the PBL experience on workplace readiness. A two-by-two diagram was used to reflect these impacts. Workplace readiness was assessed from the interview questions that directly related to the critical workplace skills identified previously (technological savviness, creativity, critical thinking, communication, and innovation). To assess the implications of the eight elements, the summary results shown in Table 2 were scored to reflect the magnitude with which the perceptions voiced by the students and teachers aligned with the definitions of the elements. Workplace readiness was plotted on the X-axis using a scale of 0 - 10. Adherence to the eight elements was plotted on the Y-axis using a scale of 0 - 8.

Table 2

Data Reduction: General Observations

Elements	Students		Teachers	
	<i>Israel</i>	<i>United States</i>	<i>Israel</i>	<i>United States</i>
1. Significant Content	Primarily learned skills and content	Primarily learned emotional, technical, and communication skills	Helped students develop personally, technically, and in their abilities to revise	Helped students develop intellectually and personally
	Did not witness teacher collaboration but knew it existed	Witnessed teacher collaboration but wanted it to increase	Were mentors for future life, skills, and learning	Taught technical and soft skills
			Feel the goal of education is to prepare students for life and increase their mental abilities	Feel the goal of education is to produce functioning citizens
2. 21st Century Skills	Were taught responsibility and time management	Some were taught responsibility and time management and some were not	Taught responsibility and time management indirectly and by using suggestions	Taught responsibility and time management indirectly through project work
	Found and used technology in all classes	Found and used technology frequently but not always	Observed that project groups were positive when it came to communication and assisting one another but some negative dynamics arose	Observed that small project groups demonstrated effective communication skills; larger groups tended to be hindered by poor time management and communication skills
	Had positive experiences working in groups	Had positive experiences working in groups, but would like to see better ways to assign students to groups		
3. In-Depth Inquiry	Were provided with some information sources but also had to find their own sources	Had to find their own sources	Felt students equally used teacher-directed and self-sought resources	Felt students relied on resources that students were either provided by the teacher or directed to by the teacher
	Said they received sufficient guidance from teachers	Most said they received sufficient guidance, but some said little to no support was provided	Were always open to helping students, but students often helped each other	Were the main source of guidance for students
	Project Process = Learned background → Chose topic → Researched and designed work → Made revisions → Completed project → (Some) Exhibited results	Project Process = Learned background → Formed groups → Chose topic → Researched and designed work → Made revisions → Completed project → Exhibited results		
4. Driving Question	Were typically motivated for the life of the project	Were typically motivated at the beginning or end of the project	Believe projects enhance understanding of the course content and expose students to real-world problems (and how to apply what they are learning to solve these problems)	Believe projects make the content more fun to learn and easier to apply; projects encourage ownership of the content and sometimes solidifies understanding by
	Tended to feel a strong sense of pride in their work	Tended to feel a strong sense of pride in their work		
	Felt that projects or scenarios were sometimes realistic	Felt that projects or scenarios were usually realistic		
5. Need to Know	Typically learned about the project through a lesson or verbal introduction; felt excited but were aware the project meant hard work	Typically learned about the project through an interactive activity or verbal introduction; felt excited	Introduced the project by asking the driving question and explaining it, often using examples done in the past to help clarify	Introduced the project by teaching the content, discussing possible applications, and explaining the project verbally
	Typically felt that the project was very important because of the amount of effort that would be put into it	Typically felt that the project was very important because of the amount of effort that would be put into it		
6. Voice and Choice	Felt the opportunity for student input was limited to classes and projects	Felt the opportunity for student input was possible but very limited	Indicated students did have a voice in the topic/project selection (consistent with the course subject matter)	Indicated students did have a voice in the topic/project selection (consistent with the course subject matter)
7. Revision and Reflection	Dealt with failure by conversing one-on-one with teachers or reflecting and revising their work	Most dealt with failure by initially feeling bad but then taking actions to improve themselves, however a few students simply made no effort to improve while others asked the teacher to solve the problem	Felt that peer critique opportunities existed but these need to be increased	Felt that peer critique opportunities existed but these needed to be improved or increased
	Learned to get academic help as well as to study on their own	Learned technical skills (note taking/analyzing text) or personal skills (open mind/motivation/being around right people)		
	Said projects experiences could be improved by either allowing for more revisions or making projects more fun	Said projects could be improved by rethinking the scope, allowing for more revisions, improving time management, and improving the structure of the project		
8. Public Audience	Felt that incorporating projects into the curriculum made their school more professional than neighboring schools	Felt that incorporating projects into the curriculum made their school more professional than neighboring schools	Believe the impact the project had on the community was visible on the homes and parents of students, as well as the students themselves	Believe the impact the project had on the community was minimal or nonexistent

Responses from each group were scored to reflect the adherence of the responses to the eight essential elements. Each of the eight elements was worth one point. The score a group received for its adherence to each element was based on the number of questions associated with that element. Each question comprising an element earned an equal portion of the one point. A perfect score on every element would result in a total score of eight. For example, for an element comprised of two questions, each question was worth  $\frac{1}{2}$  point. Each response to a question could score one of three ways: adhering to the element (full credit), partly adhering to the element (half credit), and not adhering to the element (no credit). Table 3 provides the results of the scoring process for adherence to the eight essential elements.

When scoring the perception of readiness for the workforce, we returned to the questions and identified those which related to the five critical workplace skills. Each group could score a maximum of ten points (two per skill). The responses to questions illuminating the practice of the critical workplace skills scored one of three ways: nonexistent (no points), somewhat existent (one point), and existent (two points).

The fourth and final step (rigor and validation) required us to check our approach and our results. We did this assessment by comparing our approach with what had been described by Lacey and Luff (2001) and Miles, Huberman, and Saldaña (2014). These articles were used to guide our approach to ensure it was consistent with acceptable practices. Once the data reduction process was complete, we shared our results with one teacher and one student from each school to confirm that we were correctly interpreting what they implied, as recommended by Lacey and Luff (2001). We chose participants who were willing to assist us and had them verify that the conclusions we reached from the interview data were realistic and reasonable. Participants were aware that differences of opinion would exist among respondents, and were requested to take this into account before agreeing that our conclusions were appropriate.

### **Observations**

During the interview process, several general observations were made. It seemed that teachers were very comfortable divulging their perceptions and experiences with less prompting from the interviewer, which we attributed to their experience in explaining abstract concepts and opinions to students. In contrast, students were less likely to provide in-depth responses to questions. We attributed this behavior primarily to boredom, which is completely understandable considering the interviewees were teenagers.

The researchers also noticed that students were often confused when asked questions about methods for expressing and communicating ideas in their work, although these questions were shown to be clear during the pilot. For future research, questions that delve into personal development, which can be abstract or difficult to capture in an interview, might need to be more carefully worded to



contribute to better responses from students. Alternatively, student responses may be more complete if there are fewer and simpler questions.

## **Results**

The results of the data collection are summarized in the table of general observations (Table 2). These observations were translated into two tables. One table disaggregated student and teacher responses from the two schools according to their adherence to the essential elements (Table 3), and the other table disaggregated responses from students and teachers according to student readiness for the workforce (Table 4).

Table 3, which compares students' and teachers' perceptions of how much their respective schools adhere to the essential elements, highlights some interesting differences in perceptions. When responding to questions asking about significant content, Israeli students believed that what they were learning was important, while US students didn't feel as strongly. This difference of opinion could exist because most of the Israeli students cited soft skills, such as using technology effectively and public speaking, as significant content, and most of the US students cited course and career specific curriculum as significant content. From these responses we concluded that many of the Israeli students were satisfied with the development of workplace skills, but some of the US students were less satisfied with their course curricula. Some of the Israeli teachers felt limited in their choices of curricula and, in turn, the significance of the content because of the need to prepare students for the Bagrut tests, which the teachers explained were a series of standardized exams given at the end of the 10th, 11th, and 12th grades and are a critical component of the college admission process. The US teachers did not feel that they were experiencing limitations in choice of content.

Table 3

*Data Reduction: Adherence to Elements*

Elements	Students		Teachers	
	Israel	United States	Israel	United States
1. Significant Content	1	0.75	0.833	1
2. 21st Century Skills	1	0.667	1	1
3. In-Depth Inquiry	0.666	0.833	1	0
4. Driving Question	0.833	1	1	1
5. Need to Know	0.5	1	0.5	0.5
6. Voice and Choice	0	0	0.5	0.5
7. Revision and Reflection	1	0.833	0.5	0.5
8. Public Audience	1	1	0	0
TOTAL	5.999	6.083	5.333	4.5

With respect to the use of technology and other 21st century skills, teachers at both schools claimed that their respective students were using technology or practicing 21st century skills such as presenting, problem solving, or teamwork on a daily basis. Israeli students, too, claimed that they use some form of technology for every single class. US students said that they often used technology and practiced these 21<sup>st</sup> century skills but not necessarily every day or in every class. Teachers in the two countries had similar perceptions about 21<sup>st</sup> century skills, whereas students in the two countries had differing perceptions.

Table 4

*Data Reduction: Readiness for the Workforce*

Essential Skill	Students		Teachers	
	Israel	United States	Israel	United States
Technology	2	1	1	2
Creativity	1	1	1	1
Critical Thinking	1	2	1	1
Communication	1	2	2	2
Innovation	1	2	1	1
<b>TOTAL</b>	<b>6</b>	<b>8</b>	<b>6</b>	<b>7</b>

With questions regarding in-depth inquiry, there were differences in perception between participants in the US and in Israel. An interesting contradiction occurred between US students and teachers. US students felt that they had to find most of their own resources for completing assignments, but the US teachers felt that students relied on them to provide resources. This seeming contradiction is probably the result of the different perceptions that students and teachers have about their experience in the classroom. US teachers may be occupied with a student who needs more guidance, leaving the more self-sufficient students to work on their own or support one another. In contrast to the situation in the US, Israeli students and teachers felt that the resources students used to complete their assignments were equally sought out individually by students and provided by a teacher. Israeli students claimed that they received sufficient guidance, and Israeli teachers claimed that they gave sufficient guidance for the project. Teachers in both countries seem to have similar perceptions in level of guidance provided to their students, while students have different perceptions on the level of guidance provided to them by teachers.

Most students responded positively to questions regarding the driving question. However, Israeli students felt less strongly than US students about the realism of scenarios and projects. The Israeli students who did not believe the scenarios were wholly realistic emphasized that they

appreciated the attempt to make the projects realistic, and the projects were more realistic than those occurring in neighboring traditional schools. With respect to the manner in which projects are introduced, students at both schools had experience with verbal project introductions and were excited to begin their projects. Only US students claimed that their projects were introduced with an activity that emphasized the reason they needed to learn the skills and curriculum required to complete the project. However, Israeli students revealed that activities were incorporated throughout the project rather than used only to introduce the project.

When asked about student voice and choice within the school and classroom, students at both schools responded by saying that they felt that they had little say in 1) the topic they were assigned for the project, 2) decisions they made within that project, and 3) the group mates they were assigned to work with. Teachers, also said that student decision-making within the project was restricted but that some degree of freedom existed.

Students at both schools showed ample use of revision and reflection claiming that they used these tools to improve upon failures and ask for help. A few US students said that they do not work on revision and reflection in class and simply accept failure when it comes. US and Israeli teachers confirmed that peer critiques were used for peer feedback. However, both groups of teachers admitted that more frequent use of peer critiques would be beneficial.

Students at both schools felt that their work made an impact on their respective communities. Interestingly, teachers at both schools disagreed with their students' perceptions. These seemingly polar perceptions between students and teachers probably stems from differing views of what constitutes "impacting the community." Interview results revealed that teachers interpreted community impact to mean tangible results that affect professionals or organizations. In contrast, students appear to view community impact as simply sharing their final products with schoolmates and relatives.

All of our observations were then translated into a two by two matrix (Figure 1) to facilitate an assessment of the implications of the PBL approach on preparation for entry into the workforce. On one axis, the perception of adherence to the eight essential elements is measured; on the other, the perception of workforce readiness is measured.

The results (as evidence by all ratings falling in the upper right hand quadrant) reveal that, in general, the closer the PBL curriculum adheres to the eight essential elements, the stronger the perception of workforce readiness (as evidence by students' ability to utilize technology, think critically, communicate effectively, design innovatively, and use creativity). While responses from all four study groups support this relationship between adherence to the elements and workforce readiness, it is noteworthy that some differences exist. First, there are differences between how participants in the two countries perceive their readiness. US students appear to have a stronger perception of their readiness to enter the workplace than do Israeli students. A similar contrast exists with respect to teachers' perceptions of student readiness. US teachers feel that their students are better prepared for the

workforce than Israeli teachers do. Second, there are differences between student and teacher perceptions in the two countries. Students and teachers in Israel have very similar perceptions of student readiness for the workplace. In contrast, US students appear to have a much more positive perception about their readiness than their teachers do.

## **Conclusions**

The evidence from our study results suggests that in these two schools, a greater adherence to the eight elements in the PBL curriculum could mean a stronger project-based learning experience and better preparation to enter the workforce. These eight elements, and their newly revised counterparts, are likely critical to the development of today's workforce.

These results showcase the strengths and weaknesses in the implementation of project-based learning in both schools, as perceived by students and teachers, respectively. These perceptions can begin to reveal some possible changes for policy and practice within these schools as well as clarify the need for further research.

According to the results presented above, some minor changes in the application of the PBL pedagogy at both schools could improve adherence to the eight elements and, in turn, improve workforce readiness. At Mevo'ot HaNegev, an increased effort in exhibiting completed projects to the community could be effective, particularly in addressing the unrealistic feeling some students expressed regarding their projects. Although Israeli students expressed initial excitement when introduced to a new project, introducing the project in a dynamic and active way perhaps with a field trip or interactive event - could help maintain that excitement throughout the project. In contrast, at High Tech High, the experience could be strengthened with more explicit instruction and practice with 21st century skills and technology on a consistent basis. Additionally, US students seem to need more support and mentorship to deal with failure as a part of their educational experience. At both schools, integrating peer critiques more frequently into the project process and exhibiting projects to the external community could contribute to improved project results as well as increased learning benefits for the students.

## **Suggestions for Future Research**

The differences in the perceptions between students and teachers as well as between US and Israeli participants do not appear to be explained completely by adherence to the eight essential elements of PBL. As seen in Figure 1, in both countries students perceive there to be a stronger adherence to the eight elements than do the teachers, but this difference is greater between US students and teachers than between Israeli students and teachers. These results raise the question of why the perceptions of students and teachers in Israel are so similar while the perceptions of students and teachers in the US are so different. With respect to the differences between student and teacher perspectives, is it possible that teachers underestimate the benefits of PBL because of the implementation difficulties teachers encounter? Or is it more likely that students have a misconception of their learning and development in class? With respect to the differences in perceptions between US

and Israeli participants, are the differences culturally based or do they arise from differences in approach? The answers to these questions will influence the direction of future research on the effectiveness of PBL.

Because project-based learning is an important component in today's educational environment, and because PBL is difficult to implement, more research is needed to assure that interested teachers have all the supporting resources they need to be successful in providing the most beneficial experience for their students. Our research results suggest a number of avenues that should be pursued to increase knowledge of the PBL approach and its effectiveness. Because perceptions are subjective, future research must move into the arena of objective data collection to demonstrate PBL effectiveness on the basis of its learning outcomes (such as demonstration of skills and competencies) (Stock, Riebenbauer, & Winklebauer, 2010). This research must extend beyond the United States and Israel. The results of this study are specific to these two countries. PBL is strongly influenced by the school culture and the country's culture. The nature of the culture of these two countries are specific and cannot necessarily inform us about other countries. If we want to extrapolate and make comparisons with other countries, we need to do further research based on data collection in the other countries. Since today's workplace is global, it will also be important to undertake detailed research on cultural differences in the PBL environment. Finally, the use of project-based learning in universities must also be researched in order to assess its effectiveness in this environment.

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