AMAZED BY MAKING: HOW DO TEACHERS DESCRIBE THEIR PBL EXPERIENCE

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ABSTRACT

This paper is based on data gathered in a study conducted during the 2015 school year, in a reputable Israeli high school experimenting project-based learning (PBL) as part of an innovative pedagogy for the information age. The overall research goal was to investigate the teachers' views of PBL and the ways by which these views have changed following the experience of designing, teaching, and evaluating PBL activities. Among the results, one noticeable theme has crystallized throughout the qualitative analysis: our participants felt excited about their in-school experiences with PBL, and expressed their enthusiasm and satisfaction repeatedly. The focus in this paper is therefore on the emergent theme of *excitement* and on its links to the realm of *making*.

KEYWORDS

High School; Making; Multi-cultural; Pedagogical Innovation

1. INTRODUCTION

"I think it's an amazing experience for kids *to make* this, I really got excited. And something here is very authentic", summarized one teacher the previous several weeks she had spent with her ninth graders, dealing with history by way of PBL – Project-Based Learning. "He *made* an amazing thing in the products evening. I'm out of words… I am shaking as I speak", added a social studies teacher in a staff meeting. Both citations were documented in a participant-observation conducted at the end of the 2015 schoolyear. What brings these teachers to feel so excited and to express their feelings to such extent? Based on a recent ethnographic study conducted in an Israeli high school branded as a school of excellence in science and technology, we suggest that at least part of the answer lies in experiencing the culture of *making*. What is known as 'the maker movement' has been dramatically expanding over the past decade, and a growing community of educational researchers and leaders see in making great potential for students, teachers, and schools (Blikstein, 2013; Kafai & Peppler, 2010).

The study here presented focused on the implementation of PBL in the school (Gerogiannis & Fitsilis, 2006) as part of an innovative pedagogy this school is experimenting in the last three years, titled 'multi-layered learning in a changing reality' (Eyal, Sivan, Almi-Melman & Cohen, 2015). PBL is often presented as a powerful educational approach for the knowledge age (McDonald, 2008; Gerogiannis & Fitsilis, 2006; Rosenfeld, 1999). It is thought of as especially appropriate for providing opportunities for collaborative experiential learning (Levy, in press; Weinberger, Stegnmann, & Fischer, 2007) as well as for students to be actively engaged in knowledge construction processes (King & Puntambekar, 2003) and to experience the maker movement (Vossoughi & Bevan, 2014). However, teachers who have been conventionally educated and trained, might find such an approach challenging (Levy & Baratz, 2013). The current research goal was therefore to investigate the teachers' views of PBL and the ways by which these views have changed following the experience of designing, teaching, and evaluating PBL activities (Dor, 2016).

Indeed, interesting results emerged from the inductive analysis of the data gathered through semi-structures interviews as well as participant observations in teachers' reflective meetings. The emergent core categories consisted of PBL-centered views, students-centered views, and teachers-centered views. The latter core category included expressions of enthusiasm, excitement, and satisfaction by the participants, like those arising from the two citations above. This paper will focus mainly on the excitement sub-category and its connection to the theme of *making*.

2. 'MULTY-LAYERED LEARNING' AS AN INNOVATIVE PEDAGOGY

The high school is a unique educational institute located in the heart of Tel Aviv, comprising middle school (grades 7-9), high school (grades 10-12), and a technological college (two years undergraduate programs in practical engineering). The school promotes excellence in math, science and technology and fosters arts through its reputable art center. As an educational institute placed within one of the busiest high-tech quarters contributing to describing Israel as a start-up nation (Senor & Singer, 2009), one of the school's flags is "educating the next generation of Israeli high-tech entrepreneurs" (as is cited in the school's website). Most of the eight hundred students come from families of immigrants from Russia and the former Russian territories. Therefore, the school emphasizes multi-culturalism and diversity hand in hand with fostering the Jewish Israeli identity. Only fifth of the students live in Tel Aviv, and the others come from cities and towns in the close periphery.

The school seeks to maintain an open system of inter-relationship with the surrounding communities. As part of such goal, an innovative approach has been formulated by the school and suggested for piloting. The approach title, 'multi-layered learning in a changing reality', denotes the school's aim to develop and implement a model of learning constructed of multiple layers of pedagogical, organizational, and technological parts (Eyal, Sivan, Almi-Melman & Cohen, 2015). The overall model was approved by the ministry of education for experimentation in 2014.

The innovative pedagogical model is based on a three-phase cyclic process including (a) Integration into the multi-cultural and dynamic reality; (b) Interpretation and choice of leading values; and (c) Making, creating, and contributing to the communities surrounding the school (see Figure 1).
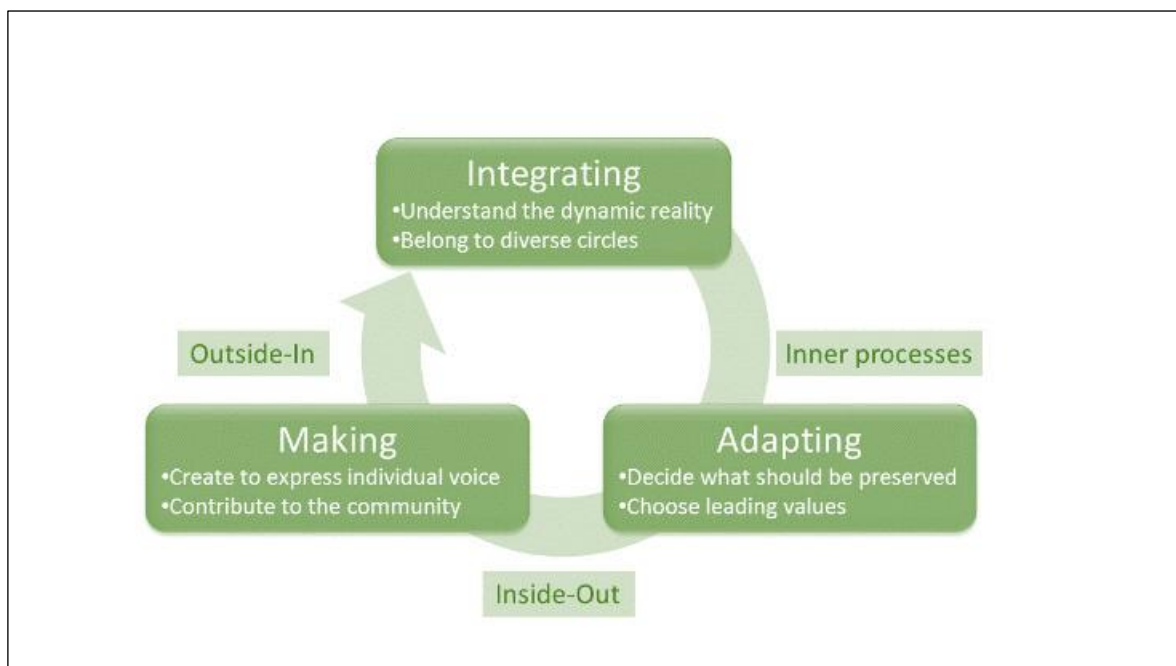

Figure 1. Principles of the 'Multi-Layered Learning' Pedagogy

By 'multi-layered learning in a changing reality', this innovative pedagogy (Levy & Baratz, 2013) reflects a process of teaching, learning, and assessment that is sensitive to the changing reality of the knowledge age in which the process takes place (McLoughlin & Lee, 2008). The technology-enhanced model (Pilkington, 2015) implemented in the school in the last three years is characterized by complexity, flexibility, relevancy, and producing. These characteristics have been evident in the curriculum as well as in the learning environment, the school culture, the organizational structure, and the teachers' role definition.

Project-Based Learning (PBL) is an important layer of the model, alongside other layers such as using tablets regularly by students and teachers; integrating R&D into school hours; cooperation with high tech companies; continuous professional development; and more. PBL is often defined as a pedagogical method

in which a real-life or authentic problem or situation is presented to students for investigation, analysis, solution, synthesis and evaluation (McDonald, 2008). It is therefore common to use PBL to denote Problem-Based Learning rather than Project-Based Learning. In both approaches, the students work individually or in groups, while the teacher acts as facilitator, coach, and sometimes even as a fellow learning partner rather than traditional instructor or tutor. In addition, the notion of group work is central to both Problem-Based Learning (Lambros, 2004) and Project-Based Learning (Livingstone & Lynch, 2002), as collaborative processes cultivate an active and interactive rather than passive approach to learning in ways that promote creativity, critical thinking and experiential learning (Barfield, 2003). The main difference between Problem- and Project-Based Learning exists in the notion of *making* which is far more prominent to the latter. In the innovative model experimented in the school, and in the research here described, PBL indeed denotes Project-Based Learning.

Introducing PBL into this school is further justified by its inherent diversity as well as the learning requirement from students to develop a broader and deeper understanding of how high tech organizations and entrepreneurs work, and how they utilize technology to improve their products in particular and the society in general. As a preparation for implementing PBL in the school, leading teachers have participated in workshops in High-Tech High in San Diego, and an in-school professional development program has been designed to deal with the changing role of the teacher as a mentor of project-based learning processes. The second author participated in these pedagogical ventures as one of the school's leading teachers during 2014, and later on developed an ethnographic research plan in her school as part of her Master of Education studies, supervised by the first author (Dor, 2016). The overall research aimed at documenting the implementation of PBL in the school through the eyes of the participating teachers. The research methodology is briefly presented next.

3. METHODOLOGY

The research combined participant observations and semi-structured interviews. The observations aimed at documenting educators meetings and their discussions of their experiences with PBL. The interviews were conducted with ten teachers using PBL in a variety of subjects during the 2015 school year. During that school year, two interviewees implemented PBL for the first time, four had two years of experience, and four had a longer experience of three or four years. Three of the interviewees were also part of the school pedagogical management staff.

The researchers used an inductive analysis method (Guba & Lincoln, 1989), in which they carefully read the data, reflected on the meaningful expressions, and colored what they interpreted as keywords (Leech & Onwuegbuzie, 2007). The primary categories that emerged were then highlighted and elaborated on. Finally, a list of fifty categories was formulated and restructured as a categorical system consisting of three core categories:

I.	PBL-centered views
II.	Students-centered views
III.	Teachers-centered views

Each of the three core categories further contained first level sub-categories. For example, the first level sub-categories of the third core category termed 'Teacher-centered views' were formulated as follows.

III-P.	Personal
III-R.	Requirements
III-S.	Support
III-T.	Teamwork

As a last analytic step, each first level sub-category was reorganized to contain 2nd level sub-categories (Leech & Onwuegbuzie, 2007). Figure 2 below visualizes the core structure created in the study (Dor, 2016), along with the first level sub-categories.
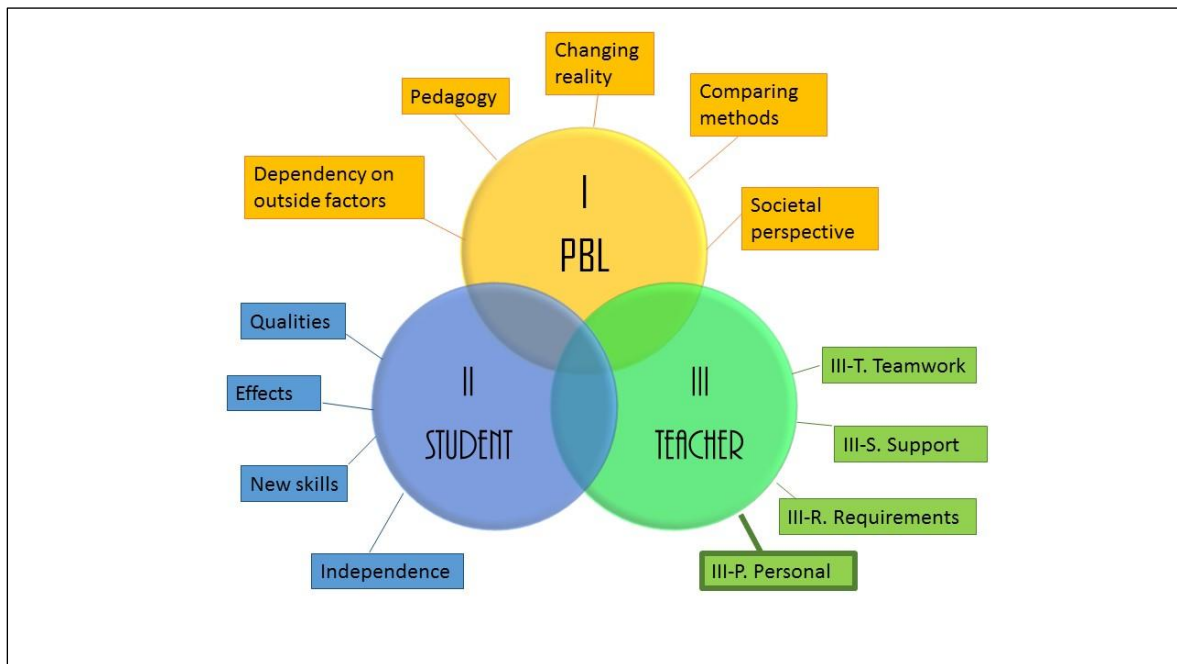
Figure 2. Core Categories and First Level Sub-Categories

The complete emergent system of categories is not presented here in details due to space limitations, but let's look for example at the 2nd level sub-categories that were classified as III-P or 'Personal' (highlighted in Figure 2 above). This sub-category contains expressions hinting at different types of personal considerations, characteristics, and feelings by the participating teachers. Three such types were found:

III-P.1   Teacher's individual character as related to success
III-P.2   Teachers expressing excitement
III-P.3   Teachers manage to change the educational reality

One noticeable type of the 'personal' teachers-centered views (coded III-P.2) comprises expressions of enthusiasm, excitement, and satisfaction by the participant teachers, like those arising from the two citations presented in the Introduction. In both cases, the excitement seems to be related with *producing* and *making*, which, as has been stated above, is regarded as a noticeable characteristic of Project-Based Learning (King & Puntambekar, 2003; Gerogiannis & Fitsilis, 2006). The following Results section will bring additional evidence linking excitement and *making*.

4. RESULTS: TEACHERS EXPRESSING EXCITEMENT

The theme of excitement was evident in all the observations and interviews conducted throughout the year of the study. Moreover, the participants described their experience with PBL in their classes using strong adjectives such as 'amazing', 'joyful', 'authentic', and 'powerful'. The teachers used such adjectives to describe both the learning processes and the products of these learning-by making processes.

One example can be found in Orly's interview (all names are pseudonyms). Orly is teaching history and social studies for ten years. She is in her forties and holds a B.A. degree. At the time of the interview she implemented PBL for the first time as part of history lessons devoted to the years of WWII and the holocaust. The projects of her students were creations related to what is known in Israel as "righteous among the nations" – an honorific used to describe non-Jews who risked their lives to save Jews. Here is one citation from the beginning of her interview:

"*It was just exceptional. They loved it. What they made… is just astonishing. Yesterday I received the final product from one student. She wrote a diary – seven pages, A4 pages!!!*" (the exclamation marks denotes Orly's tone of speech, emphasizing how excited she was).

Orly added later on in her interview, reflecting on what that student did:

"*She entered into that period; she investigated that period, as if she was writing a diary of her own life between 1925 and 1945. It is so special. It is a book. A readymade book!!!*".

Another example can be found in Abby's interview. Abby is a young social studies teacher, with a B.Ed. degree and five years of teaching experience. She implemented PBL for the second year at the time of the interview. Right at the beginning of the interview, Abby reflected on her changing role as a mentor, a guide-on-the-side rather than a sage-on-the-stage (King, 1993). Abby also commented later in the interview about how much she loved the making process:

"*Something about YOU decide what to focus on, about YOU construct the process, is very very powerful… I just love it*".

Ruth, a Biology teacher with an M.A. degree and twenty-one years of teaching experience, was among the very few teachers in the school that implemented PBL for three or four years. Reflecting on her comprehensive experience, she said:

"*I felt I'm realizing my personal desire, really and truthfully*".

Like Ruth, Sara has twenty-one years of teaching experience and three years of PBL experience. Unlike Ruth, Sara teaches bible, a humanistic rather than a scientific discipline. Regardless of their teaching discipline, both teachers used terms of excitement. Comparing the school's atmosphere at the year of the study (2015) with preceding years, Sara claimed:

"*The making this year is massive, because of the expansion* (of PBL) *and because of the huge making of teachers that engage and get excited and make*".

As a last example, we quote Sharon, a language arts teacher in her forties, with an M.A. degree and fourteen years of teaching experience. She implemented PBL for the second year at the time of the interview, and summarized her experience with satisfaction:

"*When you see that you truly did something meaningful with the students you feel satisfaction*".

When then asked if she enjoyed implementing PBL, Sharon answered:

"*Yes. I don't speak about fears, on the contrary, I speak about what's next now, what's next… we are preparing now the photography exhibition*".

At the end of the interview, Sharon mentioned again the theme of satisfaction hand in hand with the theme of excitement:

"*We must get the students excited. If we don't manage to get ourselves excited we won't be able to get the students excited and our teaching will be just boring, and I also won't be satisfied of myself*".

In addition to the examples brought above, all taken from interviews data, many more expressions hinting at excitement, satisfaction, enthusiasm etc. were documented in formal and informal staff meetings. Here is a brief list of quotes:

- "*The students succeeded to have uniforms of the Red Army with medals, partisans. They organized a real show and each student had a role. Amazing*" (History teacher)

- "*I'm truly amazed by the depth and the richness of the project, you see a very thoughtful making, that interdisciplinary, and it is very spectacular… I have a lot of satisfaction, in particular after twenty years of teaching*" (Art teacher)

- "*You surprised me; it was touching to see the integration of languages art and sports. It is not obvious to combine these two disciplines. I loved it so much*" (unspecified teacher)

Together with the pair of quotes that appear in this paper's Introduction section, the above quotes contain a collection of excitement-related terms. Furthermore, these *excitement*-related quotes also mention *making* in various forms. We interpret this duality as a possible explanation of the phenomena here presented, and suggest that one reason for the *excitement* our participants felt while experiencing PBL was their immersion into a culture of *making* (Vossoughi & Bevan, 2014).

5. CONCLUSION

Based on observations, interviews, and analyses of these qualitative data, one of this study's emergent findings highlights the links between teachers' excitement with regard to implementing PBL and practices of making across diverse disciplines within school setting. Excitement on teachers' side seems to be a noticeable advantage of the innovative pedagogy titled 'multi-layered learning in a changing reality' (Eyal, Sivan, Almi-Melman & Cohen, 2015), as well as other advantages found in our overall study but were not dealt with here. To better understand the reasons for this excitement, and to establish the connection between excitement and making, more research is needed.

Like in other cases of introducing innovative pedagogies into educational institutions (for example, Levy & Schrire, 2015), in parallel to the advantages mentioned with regard to PBL and the culture of making, the participants of this study also reported numerous challenges. These include difficulties in organizing for collaborative learning, tensions related to alternative assessment needed for evaluation of teamwork and products as opposed to traditional high stake evaluation (Nevo, Shaw, Greene, Mark, 2006), the unwillingness of some to embrace change, and more. Interestingly, other studies also report on another challenge relevant to the theme of excitement we focused at, namely over-enthusiasm of the experienced personal and its effect on novices (McDonald, 2008). No traces of such a challenge were found in our data, and the reason might be that even the most experienced participated in this study were with only three or four years of experience.

Excitement experienced by teachers in their daily practice seems to serve as a strong motivating force for both the teachers and their students. Therefore, we believe the finding focused at in this paper is of relevance far beyond the limited scope of this case study.

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