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ABSTRACT

This article aims to describe and analyze the dilemmas facing teachers when fostering student motivation in project-based learning (PjBL). The authors developed a project in secondary education through an action research approach. The different action research cycles aimed to solve dilemmas throughout the project and interpret them in terms of student motivation through the self-determination theory. According to this theory, autonomy, relatedness and competence are three psychological needs that, if fulfilled in the classroom, will lead to greater intrinsic motivation. The results revealed that one of the main characteristics of PjBL, namely, presenting the final product to an external audience, led to a tight schedule. This time-pressure context generated the majority of dilemmas, which affected the development of the three basic psychological needs, especially competence and autonomy.

Keywords: project-based learning, motivation, music education, drama education, teacher dilemmas, self-determination theory

Teaching Dilemmas and Student Motivation in Project-based Learning in Secondary Education

Student motivation in the secondary school classroom is a major concern for educators. Research has documented that motivation and engagement decline across grades and from the start to the end of the school year in secondary education (Gnambs & Hanfstingl, 2016; Skinner et al., 2008). Thus, as teachers we need to generate more motivationally supportive environments. Recent decades have witnessed a growing interest in project-based learning (PjBL) as a way to create more student-centered approaches and to foster motivation in students and teachers alike (Blumenfeld et al., 1991).

PjBL is a student-centered teaching method in which the teacher's role is that of a facilitator and not a knowledge provider (Lam et al., 2009). During the project, students create a final artefact using research strategies, which lead them to perceive their work as personally meaningful (Larmer & Mergendoller, 2010; Wurdinger et al., 2007). According to Blumenfeld et al. (1991), project work consists of two fundamental components: a driving question that serves to guide the project and a final product that addresses the driving question.

Because students create and design a project that is meaningful to them through collaborative learning, PjBL has a positive impact on their motivation (Liu et al., 2006; Wang et al., 2011). Several studies have found a positive relation between motivation and project work in secondary education (Allison et al., 2015; Chiang & Lee, 2016; Dvorak, 2012;

Holmes & Hwang, 2016; Hui, 2016; Lam et al., 2009; Remijan, 2017). However, in order to develop the motivational potential of projects, teachers need to know how motivation works in theory and in practice (Botella & Ramos, 2019a).

As stated by Pine (2009), "although it has been assumed that educational research and practice should be intimately tied together, research and practice seem to be more disconnected and alienated from each other than ever before" (p. 3). Considering the different research methodologies in education today, action research (Altrichter et al., 1993) can be especially useful to connect theory and practice, helping teachers to improve their work through educational research (Pelton, 2010). This practice-based research implies a process of systematic reflection, inquiry, and action carried out by practitioners in their own teaching practice (Frost, 2002). Through action research, theory and practice can therefore be connected within PjBL in a meaningful way (Botella & Ramos, 2019b).

The present study analyzes an action research project aimed at improving motivation in PjBL according to the principles of the self-determination theory. The action research enabled the connection between theory and practice. By identifying problems with motivation during the project, we were able to solve them through theory-based actions.

Motivation and the Three Basic Psychological Needs

The self-determination theory (Deci & Ryan, 1985, 2000, 2016; Vansteenkiste et al., 2020) is a broad framework for the study of human motivation. Self-determination theory posits that motivation can be conceptualized as a continuum ranging from amotivation to extrinsic motivation and to intrinsic motivation. The different types of motivation vary in the degree to which they are experienced autonomously. When people are intrinsically motivated (the most self-determined form of motivation), they experience an internal perceived locus of causality; specifically, they feel initiative and ownership in acting (deCharms, 1968).

Autonomous forms of motivation, including two types of extrinsic motivation, are associated with a host of positive outcomes from greater academic performance, creativity and persistence, to enhanced learner wellness (Ryan & Weinstein, 2009). These forms of motivation are sustained by the satisfaction of three basic psychological needs: autonomy, competence and relatedness (Deci & Ryan, 2000). The theory gives empirical attention to the degree to which the needs are supported rather than thwarted, postulating that greater satisfaction of the basic needs will be related to more positive outcomes (Deci & Ryan, 2016).

The need for competence is defined as the need to offer optimal challenges and effectance-relevant feedback (Ryan & Deci, 2004). This need is not an attained skill, but rather is a felt sense of confidence in action (Ryan & Deci, 2004). Fostering competence in secondary education is challenging because teachers have to design activities and projects that provide every single student with a sense of competence, which is especially difficult when teaching large groups.

The need for autonomy can be supported by minimizing any sense of coercion and by maximizing students' perceptions of having a voice and choice in the academic activities (Niemiec & Ryan, 2009). More specifically, educators should develop autonomy-supportive teaching approaches (Reeve, 2016; Patall et al., 2018). According to Cheon et al. (2020), this teaching style consists of taking the students' perspectives, providing choices, supporting their interests, allowing them to work at their own pace, communicating a tone of understanding, providing explanatory rationales, acknowledging negative feelings and using invitational language. In contrast, autonomy is thwarted when teachers pressure students to think, act or feel in particular ways (Reeve, 2009).

Finally, the need for relatedness refers to feeling meaningfully connected and cared for by others and having a sense of belonging (Deci & Ryan, 2000). In school, relatedness can be satisfied by perceiving oneself to be an important part of the group and being accepted by teachers and peers (Gnambs & Hanfstingl, 2016). Relatedness-supportive teacher behaviors—individualized conversation with students, task-related support, promotion of cooperation and teamwork, demonstrating awareness, showing care and engaging in general friendly communication—are positively related to self-determined forms of motivation (Sparks et al., 2016).

In the context of education, self-determination theory indicates that, when teachers promote autonomy, competence and relatedness, students are more likely to become motivated and engaged. Due to the decline of academic motivation during adolescence, adequate satisfaction of the three basic psychological needs in school is crucial for academic success (Gnambs & Hanfstingl, 2016; Ryan & Deci, 2004).

Dilemmas in Teaching

In order to foster intrinsic motivation in students, teachers need to promote the three basic psychological needs. However, the promotion of autonomy, competence and relatedness can be problematic considering the complexity of a classroom. Many of these problems can be regarded as dilemmas. The concept of dilemma can therefore provide a framework to disclose how teachers deal with basic psychological needs in practice.

Dilemmas are conflicts in which there are equally viable alternatives, each of which has benefits and disadvantages (Enyedy et al., 2006; Lampert, 1985). Furthermore, unlike a problem that can be solved, a dilemma cannot be completely resolved (Scager et al., 2017). In that sense, when choosing an

action to solve a dilemma, consequences and outcomes must also be considered (Cabaroglu & Tillema, 2011). Because there are no inherently 'right' answers, whatever the action taken, the teacher will always have "a residue of guilt" (Chee et al., 2015, p. 518). However, as Denicolo (1996) states, such tension can be productive for professional growth if it triggers deep reflection in teachers' minds.

According to the contradictions individual teachers experience in their daily practice, Scager et al. (2017) note the existence of a dilemmatic nature of teaching. Considering the teacher as dilemma manager (Lampert, 1985) or as classroom decision-maker (Cabaroglu & Tillema, 2011) implies accepting conflict as endemic, and even useful, rather than seeing it as a burden that must be eliminated.

Teaching dilemmas can develop around curriculum, teaching strategies, student learning, classroom management or interactions between teachers and students (Enyedy et al., 2006; Pareja & Margalef, 2013). For this reason, dilemma analysis (Winter, 1982) can help teachers cope with problems in their classrooms and improve their teaching. Furthermore, Khan (2018) maintains that the analysis of dilemmas can also be used to enhance the competence of teachers during educational innovations.

Aim of the Current Study

Although teacher dilemmas are recognized as being central to teaching, no research exists that considers the relationship between student motivation and teacher dilemmas in PjBL. Dilemma analysis can be used to generate a summary interpretation which is reasonable and of practical value in the complex context of an action research project (Winter, 1982). The aim of the present study is to identify the dilemmas that a teacher faces in trying to develop student motivation during PjBL. In line with the literature outlined above, we analyze the action research developed during the project through the following research questions:

(1) What kind of dilemmas were related to the three basic psychological needs during the project?

(2) How did the dilemmas emerge and develop through the action research cycles?

(3) What does dilemma analysis reveal about motivation in PjBL in practice?

Method

Research Context and Participants

The authors of this study were involved in this action research project as active members: the first author adopted the role of critical friend (Deuchar, 2008) and the second author served as teacher–researcher and project leader. The teacher-researcher was in charge of (a) developing PjBL; (b) identifying the different cycles of action research; (c) implementing solutions for each cycle and (d) writing up the action research reports. The main tasks of the critical friend consisted of (a) supervising the project and action research design; (b) facilitating teacher reflection around the action research cycles; (c) analyzing the action research reports and (d) assessing the project and the results of the action research cycles.

The project was developed by two groups of tenth-grade students in a Spanish high school (average age of the students was 15.80; SD= .54). The general music class (n=12; 7 girls, 5 boys) and the drama class (n=21; 15 girls, 6 boys) worked together to adapt Alessandro Baricco's novel Silk into a theater production with live music and dance. The teacher-researcher taught both groups, which made organization much easier. Both groups participated in three sessions per week, each of which lasted 55 minutes. The project was divided into three phases: (1) students read the book and wrote a theatre script, (2) musicians, and actors and dancers worked in separate groups to create the different parts and (3) all students participated in the general rehearsals.

The project was guided by the methodological principles of action research (Kemmis & McTaggart, 2000). The action research cycles aimed to solve problems as the project developed. These problems were interpreted in terms of student motivation through self-determination theory. With every action research cycle, we used a short action research case report (McKernan, 1991). In this document we followed five steps: (1) identifying and describing a problem, (2) analyzing the problem in terms of the three basic psychological needs, (3) implementing an action strategy in order to solve the problem, (4) observing and reflecting on the action taken, and (5) implementing a second action strategy or closing the cycle.

Data Analysis

The current study followed qualitative research procedures based on content analysis of the 26 action research case reports implemented during the project. Content analysis (Bardin, 2001) was developed through a deductive approach (Elo & Kyngas, 2008). The analysis was based on an earlier theory—self-determination theory in this case—and then moved from theory to teaching practice. To that end, we first developed a categorization matrix (Table 1) and then coded the data according to the categories.

Codes and categories were created and refined through a constant comparison process (Suter, 2012). All the data collected were analyzed using Nvivo 12. First, the first author coded and categorized the reports in chronological order,

the objective being to categorize teaching dilemmas according to the three basic psychological needs. Some dilemmas were identified across several action research cycles, whereas some cycles showed no dilemmas. Once the dilemmas were established, the second author reviewed the analysis. Finally, both authors discussed the analysis and settled any disagreement on the categories and dilemmas.

	Autonomy	Competence	Relatedness
How is each dilemma related to the three psychological needs?			

Table 1. Categorization matrix for the deductive content analysis

Results

Overview of the Dilemmas

A total of 26 action research case reports were completed during the six months of the project. Although every report described one action research cycle, it is important to stress that most cycles were closed after two or three interventions. The problems identified in each action research cycle were analyzed for the three basic psychological needs. Following analysis, we proposed and developed an intervention, which on many occasions led to one or several dilemmas. Content analysis did not reveal significant differences between the dilemmas experienced by each of the groups. Table 2 lists the dilemmas identified during the action research cycles and the frequency of the solutions for every dilemma.

Description of the Dilemmas Regarding the Three Basic Psychological Needs

Each dilemma was mainly related to a basic psychological need. Looking at the total number of interventions according to each basic psychological need (Figure 1), the need for competence, followed by the need for autonomy, generated most of the dilemmas during the project.

Although PjBL increases the possibilities of interaction among students, the need for relatedness was only associated with three of the dilemmas (Numbers 7, 8, and 9). Dilemma Number 7 referred to interpersonal problems among peers and was detected on two different occasions. In the first case, we decided to let students solve their problems by themselves because the problem did not affect the classroom dynamics. In the second case, we mediated between the students because the conflict was negatively impacting the classroom environment.

Dilemma Number 8 appeared at the beginning of the project and questioned one of the main characteristics of PjBL, namely, showing the end product to an external audience (Larmer & Mergendoller, 2010). Staying in the comfort zone of the classroom ensures less pressure on both the teacher and the students and greater flexibility with deadlines. On the other hand, showing the students' work to other people can foster the need for relatedness and lends a sense of authenticity to the final product. Finally, we decided to stage the play at a theatre festival at the end of the school year, which resulted in a very strict project schedule.

Another important dilemma regarding relatedness was Dilemma Number 9, for which we had to choose between individual and collective work. This dilemma appeared twice, and although collaborative work is more desirable for fostering relatedness, we favored individual work in both occurrences. The project schedule was very tight; therefore, individual work seemed to be more efficient.

The need for autonomy was identified exclusively in Dilemma Number 1. This dilemma arose when we proposed a new activity and had to choose between giving more autonomy to students or establishing more teacher control over students to maximize effectiveness. In most cases, we chose teacher intervention over student autonomy because we needed to meet tight deadlines. An important note is that on four occasions, after the students were offered more autonomy, their autonomy was withdrawn by teacher intervention because of lack of efficiency in the students' work. In this sense, an argument can be raised that the need to meet deadlines affected the possibility of offering more autonomy to students.

Finally, the need for competence was mainly associated with six different dilemmas. In Dilemmas Numbers 2 and 3, the different abilities and learning paces of the students played a key role in the creation of and solution to the dilemmas. When creating small groups for collaborative activities in Dilemma Number 2, we had to choose between ability and heterogeneous ability grouping. In all cases, we decided to bring together students with different abilities in a single group. The more talented students could therefore help their peers to carry out the activity and learn about cooperation. However, this technique was more complex in terms of organization and management.

	Dilemma	*Solution*	*Frequency*
Autonomy	#1. Autonomy vs. maximizing effectiveness through teacher intervention	• In favor of teacher intervention	13
		• In favor of giving more autonomy to students	8
Competence	#2. Ability grouping vs. heterogeneous grouping	• In favor of grouping by ability	0
		• In favor of heterogeneous grouping	3
	#3. Moving forward with the project vs. not leaving students behind	• In favor of continuing the project despite the fact that some students cannot complete certain activities	0
		• In favor of not leaving students behind by	
		Adapting activities to the abilities of some students	3
		Allowing more time for the activities	7
		Improving scaffolding through support activities and rubrics	4
	#4. Working only within school hours vs. planning some rehearsals outside school hours (in the afternoon)	• In favor of working only within school hours	0
		• In favor of planning some rehearsals outside school hours in order to improve the final product of the project	7
	#5. Theory vs. practice	• In favor of reducing the theoretical content of the subject in order to allow more time for the end product	1
		• In favor of maintaining the theory part of the subject	0
	#6. Concentrating more deeply on some parts of the project vs. moving forward with the project even if some parts are not perfectly executed	• In favor of concentrating more deeply on some parts of the project	8
			5
Relatedness	#7. Let students solve their interpersonal problems by themselves vs. mediate between them in order to solve these problems	• In favor of mediation	1
		• In favor of letting students solve their interpersonal problems by themselves	1
	#8. Showing the work of the students to an audience outside the school vs. staying in the comfort zone of the classroom	• In favor of facing a real audience	1
		• In favor of staying in the comfort zone of the classroom	0
	#9. Favoring individual work over collaboration in some activities vs. favoring collective work in every activity	• In favor of working collaboratively in every activity	0
			2

Table 2. Dilemmas identified in action research reports and solutions implemented by the teacher

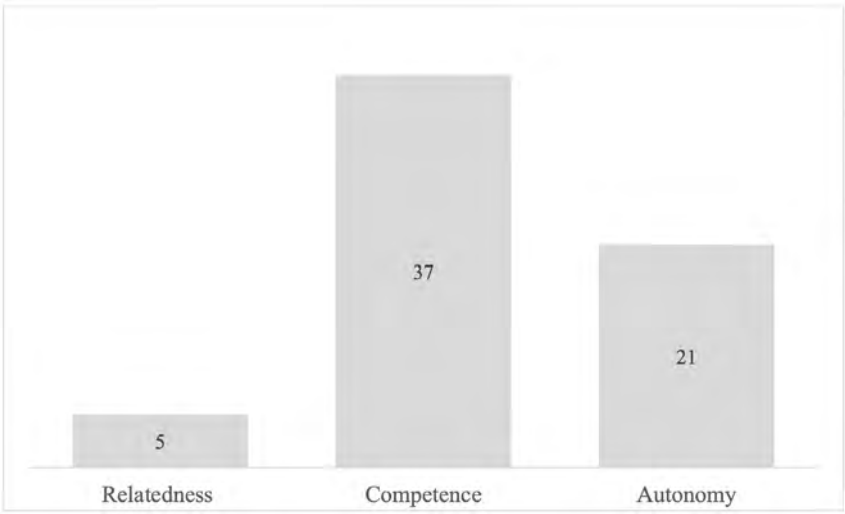

Figure 1. Total number of solutions to dilemmas according to the three basic psychological needs

The difference in ability between students was also behind Dilemma Number 3. This dilemma appeared when some students experienced difficulties with certain activities. On the one hand, we needed to move forward with the project because of deadlines. On the other hand, as teachers, we must adapt teaching strategies and activities to students' needs. In all cases, we decided not to leave students behind, thereby fostering the need for competence, even when that decision delayed the project schedule. To help students with the activities, we developed three different strategies: (a) adapting the activity itself to some students; (b) allowing more time for the activity; and (c) improving scaffolding through support activities and rubrics. All the strategies required extra time for implementation.

Dilemma Number 4 showed the difficulty of developing PjBL in an ordinary school timetable. In our case, the timetable of the groups participating in the project (music and drama education) was not specifically adapted for project work: both groups had three sessions per week, and every session lasted only 45 minutes. The dilemma was whether to work only within school hours—meaning that the students had insufficient time to improve their performance, which affected the need for competence—or to plan some rehearsals outside school hours. In every instance, the dilemma was solved by planning a rehearsal after school.

Dilemma Number 5 appeared at the beginning of the project. When designing the initial project structure, we had to choose to reduce the theoretical content of the subjects, allowing more time for practice activities, or to reinforce the theory. Ultimately, we decided to concede more weight to practice because we consider that performing in front of an audience is quintessential to music and drama education. Moreover, artistic practice can also foster the need for competence.

The pursuit of perfection is an intrinsic characteristic of artistic practice. However, the artist must balance the level of perfection to be reached with the need to complete the work. Similarly, teachers working in PjBL have to evaluate how much time can be spent on improving the different parts of the project to present the final product at a given date. As in Dilemmas Numbers 1, 2, 4, and 9, Dilemma Number 6 was also related to time management. On the one hand, striving for perfection in every part of a project can jeopardize the completion of it. On the other hand, moving forward with the project, even though some parts are not perfectly executed, can lead to a poor final product and have a negative impact on the students' need for competence. Thus, in order to balance the two different solutions to the dilemma, we did not allow one option to prevail over the other in the long term.

Discussion

The development of PjBL in secondary education is a complex and challenging process that generates problems and dilemmas. The main goal of the action research carried out during the project was to find solutions to these problems in order to both foster students' three basic psychological needs and finish the project in time. Indeed, the interaction between these two elements—deadlines and the development of basic psychological needs—generated most dilemmas.

According to Cabaroglu and Tillema (2011), time management is an important source of dilemmas because time constraints negatively affect content and the way it is delivered. Because one of the main features of PjBL is to culminate in the public presentation of the final product (Larmer & Mergendoller, 2010), time pressure is inevitable when developing a project. This pressure can be especially salient when PjBL incorporates the performing arts and the project ends with a final performance (Marquette & Bailey, 2017).

Dole, Bloom and Kowalske (2016) posit that time constraints appear mainly in PjBL when creating the final product. In our case, time-associated dilemmas appeared throughout the project, from initial design to the final performance, and affected the development of all three basic psychological needs. Connecting the classroom with the real world is an essential characteristic of PjBL for fostering students' motivation (Larmer & Mergendoller, 2010). Thus, one of the strengths of the project was performing the play in front of a real audience. However, the final performance at the theater festival also increased pressure both on the project and students.

Autonomy

According to the principles of self-determination theory, deadlines can diminish the perception of autonomy because people experience them as controllers of their behavior (Ryan & Deci, 2000). Dilemma Number 1 showed the difficulty of striking a balance between granting autonomy to students and maintaining a productive work pace in order to meet deadlines. Although PjBL teachers must relinquish some control and allow students to work more independently (English & Kitsantas, 2013; Wurdinger et al., 2007), teacher control is essential to ensure learning (Britzman, 1986). In Dilemma Number 1, the consequences of teacher intervention were that students had fewer opportunities to work autonomously.

However, knowing that an extrinsic constraint (teacher intervention) can undermine the need for autonomy does not mean that it will necessarily do so (Burgess, Enzle & Schmaltz, 2004). Autonomy can also be nurtured through clarifying goals and providing feedback, offering explanatory rationales when choice is not possible, relaying on students through informational noncontrolling language, and acknowledging and accepting students' expressions of negative affect (Krijgsman et al., 2019; Reeve, 2009). In this manner, teachers can impose external limits in an autonomy-supportive way (Koestner et al., 1984; Deci & Ryan, 2016).

Although teacher intervention can be handled in an autonomy-supportive way, fostering student self-regulated learning is essential in PjBL (English & Kitsantas, 2013). As stated by Berlak and Berlak (1981), when working with dilemmas, the problem lies in the difficulty of weighing the consequences of the different options. In Dilemma Number 1, neither of the consequences of the two options (not finishing the project in time versus, not fostering self-regulation in students) were desirable. To minimize these effects, we tried to balance solutions to the dilemma throughout the project. In that sense, we contemplated the project as a dilemmatic space (Honig, 1996), in which each dilemma was not regarded as a discrete event but as part of an organic process.

As stated by Aelterman et al. (2019), autonomy support and control are two discrete dimensions of teaching, rather than opposites falling along a single continuum. In that sense, this strategy—creating a dilemmatic space—is aligned with the principles of self-determination theory: "teachers may regress (i.e., shifting from need-supportive to need-thwarting teaching) or progress (i.e., shifting from need-thwarting to need-supportive teaching) over different periods of time" (Aelterman et al., 2019, p. 518).

Relatedness

The need for relatedness also generated dilemmas associated with time management. One of the relatedness-supportive teacher behaviors is the promotion of cooperation and teamwork (Sparks et al., 2015; Vansteenkiste et al., 2020). However, Gillies and Boyle (2010) studied middle school teachers' perceptions about cooperative learning and found that one of the problems in cooperative learning is the socializing that occurs in the groups, which affects students' efficiency. This quandary was at the root of dilemma Number 9 (favoring individual work over collaboration in some activities versus favoring collective work in every activity), which appeared in two different action research cycles. In both cases, the teacher initially proposed a collaboration activity with students working in small groups. After some sessions, the groups were not able to maintain a productive work pace. The teacher therefore decided to favor individual work to ensure progress toward the final product of the project. As this dilemma shows, the need to advance more efficiently through the different stages of the project undermined the full development of this basic psychological need, which may ultimately affect student motivation.

Competence

The need for competence was also affected by time pressure. This problem was especially salient in Dilemmas Number 3 (moving forward with the project versus not leaving students behind) and Number 6 (concentrating more deeply on some parts of the project versus moving forward with the project even though some parts were not perfectly executed).

According to different authors, one of the main dilemmas in education is maximizing challenge versus keeping all students on board (DeLapp, 1980; Lampert, 1985; Scager et al., 2017; Shapira-Lishchinsky, 2011). In the context of PjBL, Perrenoud (1998) stated that there is no optimal solution when a student is left behind during the project. The need to advance toward the final product therefore creates an ethical dilemma. In Dilemma Number 3, we decided not to leave students behind, though that decision threatened the project schedule. The dilemma was solved in most cases by allowing more time for the activities.

Furthermore, allowing more time for the activities generates another problem: some students can feel bored if they have already mastered the activity. For that reason, offering a challenging task is one of the elements that fosters student motivation in PjBL (Lam et al., 2009; Pedersen, 2003; Pekrun, 2006). Dilemma Number 3 therefore directly affected the psychological need for competence. It is important to recognize that creating an optimal challenge level for all students in a class is nearly impossible (Scager et al. 2017), which is why the solution to this dilemma was so difficult in practice. As stated by Lampert (1985), managing dilemmas requires admitting some essential limitations.

Finally, Dilemma Number 6 also exposed the difficulty to foster the need for competence in a time-pressure context. In coping with the dilemma, we tried to strike a balance between seeking perfection in every part of the performance and finishing the project in time. On the one hand, continuous progress and the pursuit of perfection have been two central ideas in art throughout the ages (Puu, 2015). Thus, developing a PjBL through the performing arts must foster this specific trait of the artist's personality in the students. On the other hand, deadlines must be met; therefore, the more we work on some parts of the performance, the less time we have for the others.

Conclusion

The purpose of this study was to describe and analyze the dilemmas that teachers face when fostering student motivation in PjBL. The action research carried out during the project was designed to foster the three basic psychological needs as described by the self-determination theory. Analysis of the action research cycles showed that one of the main characteristics of PjBL, namely, presenting the final product to an external audience, led to a tight schedule. This time-pressure context generated different dilemmas that affected the development of the three basic psychological needs, especially those of competence and autonomy.

According to Keren (2005), taking arbitrary action to solve a dilemma is not an option. Solving each dilemma therefore forced us to think about the consequences in terms of learning outcomes, students' motivation and completion of the final product. For this reason, we did not base our decisions throughout the project on every dilemma as an isolated episode but as an event interconnected with other dilemmas. In other words, we considered the project as a dilemmatic space. Thus, balancing solutions to each dilemma was crucial to minimizing the effects of every single decision.

As this action research shows, PjBL does not develop motivation per se: teachers need to foster the three psychological needs and present the final product at a given date. Teachers must therefore establish clear strategies to achieve that goal. First, autonomy cannot be delivered freely across the projects. Teachers must therefore impose external limits in an autonomy-supportive way (clarifying goals and providing feedback, offering explanatory rationales when choice is not possible, using noncontrolling language, and accepting students' expressions of negative affect). Second, teachers must keep all students on board to foster the need for competence, which requires time and is more difficult to achieve when groups are larger and projects are more complex. Third, developing a collaborative working environment is important, but teachers must control and optimize group work to finish the final product of the project in time.

In conclusion, this study offers insights into how PjBL can foster the three basic psychological needs in a time-pressure context. As stated by Porath (2016), analyzing dilemmas can bridge the gap between research and practice. In our case, the dilemmas identified through this action research shed light on how the basic elements of motivation—competence, autonomy and relatedness—function in PjBL in practice.

References

Aelterman, N., Vansteenkiste, M., Haerens, L., Soenens, B., Fontaine, J. R. J., & Reeve, J. (2019). Toward an integrative and fine-grained insight in motivating and demotivating teaching styles: The merits of a circumplex approach. Journal of Educational Psychology, 111(3), 497-521. https://doi.org/10.1037/edu0000293

Allison, P., Gray, S., Sproule, J., Nash, C., Martindale, R., & Wang, J. (2015). Exploring contributions of project-based learning to health and wellbeing in secondary education. Improving Schools, 18(3), 207-220.
https://doi.org/10.1177/1365480215599298

Altrichter, H., Posch, P., & Somekh, B. (1993). Teachers Investigate their Work: An introduction to the methods of action research. Routledge.

Bardin, L. (2001). L'analyse de contenu. Presses Universitaires

de France.

Berlak, A., & H. Berlak (1981). Dilemmas of Schooling: Teaching and Social Change. Methuen.

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. Educational Psychologist, 26, 369-398. https://doi.org/10.1080/00461520.1991.9653139

Botella, A. M., & Ramos, P. (2019a). La teoría de la autodeterminación: un marco motivacional para el aprendizaje basado en proyectos. Contextos educativos: Revista de educación, 24, 253-269. https://doi.org/10.18172/con.3576

Botella, A.M., & Ramos. P. (2019b). Investiga¬ción-acción y aprendizaje basado en pro¬yectos. Perfiles Educativos, 41(163), 109-122.

Britzman, D. P. (1986). Cultural myths in the making of a teacher: Biography and social structure in teacher education. Harvard Educational Review, 56(4), 442-456.

Burgess, M., Enzle, M. E., & Schmaltz, R. (2004). Defeating the potentially deleterious effects of externally imposed deadlines: Practitioners' rules-of-thumb. Personality and Social Psychology Bulletin, 30(7), 868-877. https://doi.org/10.1177/0146167204264089

Cabaroglu, N., & Tillema, H. H. (2011). Teacher educator dilemmas: a concept to study pedagogy. Teachers and Teaching, 17(5), 559-573. http://dx.doi.org/10.1080/13540602.2011.602210

deCharms, R. (1968). Personal causation. Academic Press.

Chee, Y. S., Mehrotra, S., & Ong, J. C. (2015). Authentic game-based learning and teachers' dilemmas in reconstructing professional practice. Learning, Media and Technology, 40(4), 514-535.http://dx.doi.org/10.1080/17439884.2014.953958

Cheon, S. H., Reeve, J., & Vansteenkiste, M. (2020). When teachers learn how to provide classroom structure in an autonomy-supportive way: Benefits to teachers and their students. Teaching and Teacher Education, 90, 1-11. https://doi.org/10.1016/j.tate.2019.103004

Chiang, C. L., & Lee, H. (2016). The effect of project-based learning on learning motivation and problem-solving ability of vocational high school students. International Journal of Information and Education Technology, 6(9), 709-712. https://doi.org/10.7763/IJIET.2016.V6.779

Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Plenum.

Deci, E. L., & Ryan, R. M. (2000). The What and Why of goal pursuits: human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E.L., & Ryan, R.M. (2016) Optimizing students' motivation in the era of testing and pressure: A self-determination theory perspective. In: Liu W., Wang J., Ryan R. (eds), Building autonomous learners (pp. 9-29). Springer.

DeLapp, S. (1980). Dilemmas of Teaching: A Self- Reflective Analysis of Teaching in a Third-Fourth Grade Informal Classroom. Unpublished doctoral dissertation. Ohio State University.

Denicolo, P. (1996). Productively confronting dilemmas in educational practice and research. In M. Kompf, W. R. Bond, D. Dworet and R. T. Boak (eds.). Changing research and practice: teachers' professionalism, identities and knowledge (pp. 57-65). Falmer Press.

Deuchar, R. (2008). Facilitator, director or critical friend? Contradiction and congruence in doctoral supervision styles. Teaching in Higher Education, 13(4), 489-500. https://doi.org/10.1080/13562510802193905

Dole, S., Bloom, L., & Kowalske, K. (2016). Transforming pedagogy: Changing perspectives from teacher-centered to learner-centered. Interdisciplinary Journal of Problem-Based Learning,10(1). https://doi.org/10.7771/1541-5015.1538

Dvorak, R. (2012). Motivation towards learning: a study of Alberni District Secondary School's project-based learning Grade 9 program. Unpublished dissertation. Vancouver Island University.

Elo, S., & Kyngas, H. (2008). The qualitative content analysis process. Journal of Advanced Nursing, 62(1), 107-115. http://dx.doi.org/10.1111/j.1365-2648.2007.04569.x

English, M. C., Kitsantas, A. (2013). Supporting student self-regulated learning in Problem- and Project-Based Learning. Interdisciplinary Journal of Problem-Based Learning, 7(2), 128-159. https://doi.org/10.7771/1541-5015.1339

Enyedy, N., J. Goldberg, & K. Welsh (2006). Complex dilemmas of identity and practice. Science Education, 90(1), 68-93. https://doi.org/10.1002/sce.20096

Frost, P. (2002). Principles of the action research cycle. In Ritchie, R., Pollard, A., Frost, P., and Eaude, T. (Eds.), Action research: a guide for teachers. Burning Issues in Primary Education, 3 (pp. 45-83). National Primary Trust.

Gillies, R. M., & Boyle, M. (2010). Teachers' reflections on cooperative learning: Issues of implementation. Teaching and Teacher Education, 26, 933-940. https://doi.org/10.1016/j.tate.2009.10.034

Gnambs, T., & Hanfstingl, B. (2016). The decline of academic motivation during adolescence: an accelerated longitudinal cohort analysis on the effect of psychological need satisfaction, Educational Psychology, 36(9), 1691-1705, https://doi.org/10.1080/01443410.2015.1113236

Holmes, V. L., & Hwang, Y. (2016). Exploring the effects of project-based learning in secondary mathematics education. The Journal of Educational Research, 109(5),

449-463. https://doi.org/10.1080/00220671.2014.979911

Honig, B. (1996). Difference, dilemmas, and the politics of home. In S. Benhabib (Ed.), Democracy and Difference. Contesting the Boundaries of the Political (pp. 257-277). Princeton University Press.

Hui, W. K. Y. (2016). Motivating native Hawaiians by project-based learning: A narrative inquiry. Doctoral dissertation. University of Phoenix.

Kemmis, S., & McTaggart, R. (2000). Participatory action research. In N. Denzin & Y. Lincoln (Eds.), Handbook of qualitative research (pp. 559-603). London: Sage.

Keren, R. (2005). Action research: Student teachers coping with professional dilemmas. Doctoral thesis. University of Leicester.

Khan, S. (2018). Dilemmas in educational innovation. Unpublished doctoral thesis. Massey University.

Koestner, R., Ryan, R.M., Bernieri, F., & Holt, K. (1984). Setting limits on children's behavior: The differential effects of controlling versus informational styles on children's intrinsic motivation and creativity. Journal of Personality, 54, 233-248.

Krijgsman, C., Mainhard, T., Tartwijk, J. V., Borghouts, L., Vansteenkiste, M., Aelterman, N., & Haerens, L. (2019). Where to go and how to get there: Goal clarification, process feedback and students' need satisfaction and frustration from lesson to lesson. Learning and Instruction, 61, 1-11. https://doi.org/10.1016/j.learninstruc.2018.12.005

Lam, S., Cheng, R. W., & Ma, W. Y. K. (2009). Teacher and student intrinsic motivation in project-based learning. Instructional Science: An International Journal of the Learning Sciences, 37(6), 565-578. https://doi.org/10.1007/s11251-008-9070-9

Lampert, M. (1985). How do teachers manage to teach? Perspectives on problems in practice. Harvard Educational Review, 55, 178-194.

Larmer, J., & Mergendoller, J. R. (2010). Eight essentials for Project-based learning. Buck Institute for Education.

Liu, W. C., Wong, A. F. L., Divaharan, S., Peer, J., Quek, C. L., & Williams, M. D. (2006). Students' intrinsic motivation in project-based learning using an asynchronous discussion platform. Educational Research Journal, 21(2), 217-234.

Marquette, T., & Bailey, K. M. (2017). Incorporating performing arts projects into the k-8 curriculum. New York State TESOL Journal, 4(2), 1-19.

McKernan, J. (1991). Curriculum action research: a handbook of methods and resources for the reflective practitioner. Kogan Page.

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. Theory and Research in Education, 7, 133-144. https://doi.org/10.1177/1477878509104318

Pareja, N., & Margalef, L. (2013). Learning from dilemmas: teacher professional development through collaborative action and reflection. Teachers and Teaching, 19(1), 18-32. https://doi.org/10.1080/13540602.2013.744196

Patall, E. A., Steingut, R. R., Vasquez, A. C., Trimble, S. S., Pituch, K. A., & Freeman, J. L. (2018). Daily autonomy supporting or thwarting and students' motivation and engagement in the high school science classroom. Journal of Educational Psychology, 110(2), 269–288. https://doi.org/10.1037/edu0000214

Pedersen, S. (2003). Motivational orientation in a problem-based learning environment. Journal of Interactive Learning Research, 14, 51-77.

Pekrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. Educational Psychology Review,18, 315–341.https://doi.org/10.1007/s10648-006-9029-9

Pelton, R. P. (2010). Action Research for Teacher Candidates. Using classroom data to enhance instruction. Rowman and Littlefield Education.

Perrenoud, Ph. (1998). Réussir ou comprendre? Les dilemmes classiques d'une démarche de projet. Université de Genève. Faculté de psychologie et des sciences de l'éducation.

Pine, G. (2009). Teacher action research: Building knowledge democracies. Sage.

Porath, S. L. (2016). Conceptual, pedagogical, cultural, and political dilemmas of implementing a constructivist workshop approach to teaching literacy. Teachers and Teaching, 22(7), 879-891. https://doi.org/10.1080/13540602.2016.1185822

Puu, T. (2015). Perfection in art. In T. Puu (Ed.), Arts, Sciences, and Economics (pp. 119-157). Springer-Verlag.

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. Educational Psychologist, 44, 159-175. http://dx.doi.org/10.1080/00461520903028990

Reeve, J. (2016). Autonomy-supportive teaching: What it is, how to do it. In J. C. K. Wang, W. C. Liu, & R. M. Ryan's (Eds.), Building autonomous learners: Perspectives from research and practice using self-determination theory (pp. 129-152). Springer.

Remijan, K. W. (2017). Project-Based Learning and Design-Focused Projects to Motivate Secondary Mathematics Students. Interdisciplinary Journal of Problem-Based Learning, 11(1). https://doi.org/10.7771/1541-5015.1520

Ryan, R. M., & Deci, E. L. (2004). Overview of self-determination theory: An organismic dialectical perspective. In E.

L. Deci & R. M. Ryan (Eds.), Handbook of self-determination research (pp. 3-33). University of Rochester Press.

Ryan, R. M., & Weinstein, N. (2009). Undermining quality teaching and learning: A self-determination theory perspective on high-stakes testing. Theory and Research in Education, 7(2), 224-233. https://doi.org/10.1177/1477878509104327

Scager, K., Akkerman, S. F., Pilot, A. & Wubbels, T. (2017). Teacher dilemmas in challenging students in higher education. Teaching in Higher Education, 22(3), 318-335. https://doi.org/10.1080/13562517.2016.1248392

Shapira-Lishchinsky, O. (2011). Teachers' critical incidents: Ethical dilemmas in teaching practice. Teaching and Teacher Education, 27(3), 648-656. https://doi.org/10.1016/j.tate.2010.11.003

Skinner, E. A., Furrer, C., Marchand, G., & Kindermann, T. A. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? Journal of Educational Psychology, 100, 765-781. http://dx.doi.org/10.1037/a0012840

Sparks, C., Dimmock, J., Lonsdale, C., & Jackson, B. (2016). Modeling indicators and outcomes of students' perceived teacher relatedness support in high school physical education. Psychology of Sport and Exercise, 26, 71-82. https://doi.org/10.1016/j.psychsport.2016.06.004

Sparks, C., Dimmock, J., Whipp, P., Lonsdale, C., & Jackson, B. (2015). Getting connected: High school physical education teacher behaviors that facilitate students' relatedness support perceptions. Sport, Exercise, and Performance Psychology, 4, 219-236. https://doi.org/10.1037/spy0000039

Suter, W. N. (2012). Qualitative data, analysis, and design. In Suter, W. N. Introduction to educational research: A critical thinking approach (pp. 342-386). Thousand Oaks, CA: SAGE Publications, Inc.

Vansteenkiste, M., Ryan, R.M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. Motivation and Emotion, 44, 1-31. https://doi.org/10.1007/s11031-019-09818-1

Wang, C. K. J., Liu, W. C., Koh, C., Tan, O. S., & Ee, J. (2011). A motivational analysis of project work in Singapore using self-determination theory. International Journal of Research and Review, 7(1), 45-66

Winter, R, (1982). Dilemma Analysis: A contribution to methodology for action research, Cambridge Journal of Education, 12(3), 161-174. https://doi.org/10.1080/0305764820120303

Wurdinger, S., Haar, J., Hugg, R., & Bezon, J. (2007). A qualitative study using project-based learning in a mainstream middle school. Improving Schools, 10(2), 150-161. https://doi.org/10.1177/1365480207078048

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