

Personalizing Learning through Connecting Students' Learning Experiences: An Exploratory Study

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oriented towards the study of assessment and formative feedback, and the strategies for personalized school learning.

Personalizing Learning through Connecting Students' Learning Experiences: An Exploratory Study

This article presents an exploratory study aimed at analyzing the instructional design of learning personalization practices in three secondary education centers that promote connections between students' learning and/or their learning experiences in and out of school. We propose three dimensions for analysis, according to a constructivist and sociocultural perspective: the learning activities and contents designed to connect students' learning and/or learning experiences across different contexts; the educational agents that enhance these connections; and the mediating tools used. Results indicate that our multidimensional model is useful for identifying the different didactic strategies that appear in each case to foster connections, and for detecting the aspects that need improvement.

Conclusions suggest that in personalized learning environments, the focus of educational activity must be shifted from making connections between students' learning to the learning experiences that students have at different times and in different contexts, helping them to build their personal learning pathways.

Keywords: connected learning; bridging learning experiences; learning personalization; personal learning; in and out of school; k-12.

The social, cultural, political and economic transformations that have shaped what we know as the information society have also led to a profound change in the way we learn. Educational institutions are no longer considered the main contexts of activity in which children and young people acquire the knowledge that for decades has been considered essential for living in our society. Everyday learning environments are becoming increasingly important as they form a rich and complex learning ecology within which children and young people have a large variety of experiences, and develop their competencies and interests (Barron, 2006; Coll, 2016; Erstad & Sefton-Green, 2013; Ito et al., 2013; Singal & Swann, 2011). We use the label “personal

learning pathways” (Engel & Membrive, 2018) to define the set of interrelated learning experiences that people extract from their participation in activities carried out in different contexts of activity (both physical and virtual) throughout their lives. While they are outside school, children and young people build their own learning pathways based on the opportunities and resources they find and their own interests and objectives. However, in education institutions uniformity prevails as a consequence, among other factors, of a common curriculum for all students. Therefore, it is important to understand what kinds of connections are established between the learning experiences that students have in different contexts, and to help them take charge of their own personal learning pathways (DeMink-Carthew, Netcoh, & Farber, 2020).

Learning Across Different Contexts

Within this framework, a wide range of research has focused on studying how children and young people learn in the multiple contexts of activity, inside and outside school, in which they participate simultaneously (see, for example, the works that Bronkhorst and Akkerman (2016) call “multisystemic perspectives in studying learning”). Some of these works have proposed pedagogical approaches aimed at building bridges between students’ learning and/or learning experiences in these contexts of activity. These works share, in general lines, a vision of learning as a continuous and growing participation in certain settings, practices and cultural communities, and are rooted in sociocultural approaches such as the theory of historical-cultural activity (for example, Engeström, 1987), situated learning (Lave & Wenger, 1991), situated action (Suchman, 1987), distributed cognition (Hutchins & Klauson, 1998), and cultural psychology (Cole, 1996; Rogoff, 2003).

Despite these common origins, it is worth highlighting the heterogeneity of these pedagogical approaches in relation to the aspects of the learning process that are intended to support establishing connections between students' learning and/or their learning experiences. They also vary in terms of the possible elements and conditions of the scenarios that may facilitate establishing learning connections inside and outside the classroom.

Some of these pedagogical approaches focus mainly on helping students to learn certain curricular content. In this line, we find Contextualizing Instruction (Rajala et al., 2016; Silseth & Erstad, 2018), which aims to help students understand the curricular content by using situations or events that occur outside of school, or those that are of particular interest to the students. In order to guide learning, teachers, in their interactions with their students, establish relationships between the curricular content and the characteristics of the local community, examples of daily practices, personal issues and students' trips abroad.

Likewise, the works on Context personalization (Høgheim & Reber, 2017; Walkington & Bernacki, 2014) aim to involve students in the learning of certain subjects, mainly in the STEM area, based on relating the subjects to the activities that students do in their daily lives. In this case, they propose adapting the texts and the learning activities to the students' preferences and interests to make the context more familiar, and the content more attractive and motivating.

A second group of proposals aims to increase the academic performance or school integration of students from minority groups due to their socioeconomic status, foreign origin or ethnic or racial background. The Funds of Knowledge project (González, Moll, & Amanti, 2006; Llopart & Esteban-Guitart, 2018) stands out among these proposals. This project proposes converting families' skills, knowledge,

competences and instruments into educational resources, linking them with the school content and activities. The project consists of bringing the school culture closer to the family culture by training teachers in techniques such as ethnography, with the aim of visiting students' homes to document their skills and knowledge to be able to incorporate them into school educational practices. Therefore, relationships of mutual trust are created between the family and the school, and bridges of cooperation that reduce prejudices and stereotypes are built between the two contexts of activity.

A third group of proposals emphasizes learning certain contents, competences and/or skills relevant to students in the 21st century, such as the abilities needed to competently participate in multiple contexts of activity. The Boundary Crossing approaches (Akkerman & Bakker, 2011; Walker & Nocon, 2007) stand out in this line of work. These approaches postulate that learning activities in informal spaces should constitute an integral part, rather than complementary parts, of activities in formal spaces. The term "boundary activity" was coined to define activities that can facilitate interaction between the two communities, that is, schools and informal institutions. The boundary activity is defined as a learning activity that takes place indistinctly in a formal or informal context, which implies the confrontation between the opinions, knowledge, perspectives and sociocultural practices of each context, has an explicit learning objective (acquire knowledge, skills, attitudes and/or competencies) and contains at least one "boundary object", an object that acts as a bridge and helps students to connect learning in different contexts.

With a similar purpose, some authors propose the creation of Third Space Learning (Gutiérrez, Baquedano-López, & Tejada, 1999; Moje et al., 2004), which makes it possible to extend curricular activities to informal learning contexts or to create a space that goes beyond traditional institutional learning with its rigid schedules to also

include the more spontaneous, often incidental learning spaces, unconstrained by classroom walls and fixed schedules, and occasionally free of teachers and a prescribed curriculum. The “third spaces” are socially co-constructed spaces in which the students’ daily discourses are mobilized to give meaning to the content and activities carried out in the formal discourses of the school. In both approaches, Boundary Crossing and Third Space Learning, there is the underlying idea that the confrontation between two communities or activity systems generates new forms of activity, stimulated by unresolved tensions or dilemmas, which can lead to enriching learning cycles (Wenger, 1998) and expansive learning (Engeström, 1987).

The Fifth Dimension is a proposal that combines elements of the previous two approaches. It is a model for educational inclusion, and its original purpose was to design and implement activity systems in non-formal contexts located in communities of minority groups for the schooling of these historically segregated people (Cole & Distributed Consortium, 2006; Crespo et al., 2005). Recently it has been taken as a reference for developing learning experiences in formal education. In both cases, it is about creating an activity system, a third space, which does not correspond to the rules of participation and the content defined by the teaching staff, nor is it the territory of the student's world, but rather incorporates rules and content from both universes in a space of dialogue in which the various meanings are not censored nor stigmatized.

A final group of pedagogical proposals places the focus of the educational action on personal learning pathways. In these approaches it is understood that learning is closely linked to the learner’s competence to build bridges among their learning experiences, or, in other words, to construct the common thread of their personal learning pathway. The objective of this line of work, called Connected Learning, is to connect academic, professional and/or citizen contexts and communities (Kumpulainen

& Sefton-Green, 2014; Ito et al., 2013; Vartiainen et al., 2018) so that students' learning is more meaningful and lasting. This approach proposes creating learning environments that allow students to pursue their interests with the support of friends and close adults, as well as make it possible for students to connect that learning and personal interest with academic achievement, professional success and civil commitment. As Erstad et al. (2016) points out, helping to connect learning between contexts includes physical movements between different places and situations, as well as the fact that the contents, knowledge and tools of one context become relevant to another context.

Likewise, the proposals framed in Seamless Learning (Wong et al., 2015; Wong & Looi, 2011) aim to enhance the meaning of learning by building bridges (“bridging”) between the learning that students do inside and outside of class, academic and non-academic, curricular and non-curricular, face-to-face and online. To do this, they propose activities so that the skills or meanings learned in class can be later analyzed, enriched, reused and/or remixed in other learning spaces, and, conversely, what is learned in other learning spaces can be re-signified in class. In short, the knowledge, skills and meanings that can be learned and the learning process itself are in constant “recontextualization” to trigger more intense learning. The role played by wireless, mobile and digital technologies in general are central to carrying out these activities so that students can separate learning from the physical and institutional environment in which it takes place. Mobile devices, such as tablets and smartphones, make it easier for learners to carry the tools and resources that allow them to learn and build bridges in a more agile way between their learning experiences, regardless of where and when they take place.

A general look at the reviewed works highlight the existence of different approaches regarding three fundamental questions in the study of the connections

between students' learning and/or learning experiences: why is it important to establish connections; what has to be connected; and how to do it. While some of these approaches focus on connecting different activity contexts or even create new learning contexts, for others the relevant thing is to connect the learning that takes place in different contexts. In addition, for some others, what has to be connected is students' interests or preferences. Likewise, we have found important differences between the different approaches in the role they give to educational agents in establishing these connections, as well as differences in the tools being used to help students bridging in- and out-of-school learning.

Furthermore, we have not found holistic approaches in the literature review that have considered more than one type of activities to build bridges between the students' learning and/or learning experiences, nor do they take into account different types of educational agents and the mediation of different learning instruments. In our opinion, none of these approaches itself is capable to describe properly how teachers can help students to establishing connections between the learning and/or learning experiences that take place inside and outside the school. Nevertheless, the combined used of several types of learning activities, agents and tools will increase the probability of appearance of those connections.

Bridging In and Out of School Students' Learning Experiences

From a constructivist and sociocultural perspective (Coll, 2008; Wertsch, 1991), that we assume, learning is understood as a process of active construction of meaning of cultural contents that are situated in particular learning contexts and are mediated by educational agents and specific cultural tools. From our perspective, the literature reviewed on learning in and across different contexts has paid little attention to two

elements. These two aspects are closely related to each other, and both are central aspects of our approach. The first element is that the emphasis of the didactic proposals is on the learning that students achieve; however, in our opinion, proposals should focus on students' learning experiences, that is, on the experience of having learned by participating in a certain activity context (Coll & Falsafi, 2010). The learning experiences that students achieve do not depend solely on the intrinsic characteristics of the activities in which they participate. On the contrary, they are determined by subjectivity. It is the learner who interprets them in this way based on their motives for participating in the activity, their interests, their conceptions about what learning means, the vision they have of themselves as a learner, etc. For example, two students who participate in the same activity, with the same educational agents, resources, instruments and contents can have very different learning experiences. One may even feel that they have learned a lot, while the other may feel they have learned almost nothing. Consequently, the pedagogical proposals that aim to help students to connect their learning experiences should dedicate a good part of the activities to help them to analyze, reflect on, and critically assess the learning experiences they have had in the different contexts of activity in which they participate.

The second element that we would like to highlight, which has received little attention in the proposals reviewed, is the meaning and personal value that the student attributes to the learning process. Meaning, in our approach, is precisely the element that conditions the student's involvement and commitment (engagement) in the learning process, and, consequently, the degree of significance and functionality of their learning (Ausubel, 1963). Learning with meaning and personal value for the student is learning that helps them to know and understand themselves better, to understand, know and act better in the reality in which they are immersed, and to project themselves into the

future by building action plans that involve them personally (Coll, 2018; DeMink-Carthew, Netcoh & Farber, 2020). According to a conception of the idea of meaning strongly inspired by the Vygotskian concept of “perezhivanie” and its recent elaboration by different authors (González Rey, 2016; Roth & Jornet, 2016), we understand that meaning is closely associated with the learner’s learning experience, an experience in which their personal characteristics (needs, expectations, emotions, motives, etc.) and the characteristics of the activity context where the learning takes place are inextricably intertwined (agents, resources, tools, content, etc.).

Within the framework of these approaches, the proposals and strategies for personalizing learning arise (Bray & McClaskey, 2015; Coll, 2016, 2018). Those personalization strategies are intended to help students to attribute meaning and personal value to school activities and contents. In particular, personalized learning strategies have the following characteristics: (1) they correspond to the learners’ interests and objectives; (2) they have experiential and emotional components; (3) they employ the principle of ‘learning by doing’ and are oriented towards obtaining a result or producing a product; (4) they respect the learners' capacity for decision and control over their learning process; (5) they encourage learners to reflect on their own learning process and on their way of coping with and dealing with learning situations and activities; and (6) they are linked with the learners' daily activities and the culture of which they are part (Coll 2018). This last characteristic is about fostering relationships between students' learning experiences that have taken place at different times and in different contexts. In addition, recent reviews of learning science research (Dumont et al., 2010; OECD, 2006; Sawyer, 2014) highlight how one of the key principles for designing authentic educational situations and activities is establishing relationships

between the students' learning and learning experiences regardless of the time or context in which they took place (Weninger, 2017).

Purpose of the Study and Research Questions

The objective of this article is to document and analyze the characteristics of the instructional design of three learning personalization practices implemented in three high schools in Catalonia (Spain) that focused on establishing connections between the students' learning and/or learning experiences. Our research questions are the following: What are the characteristics of instructional activities designed to encourage students to connect school contents and activities with other learning experiences they have in different contexts of activity in which participate? What educational agents are involved in the learning activities at school that can potentially promote these connections? What tools are used in those learning practices to favor these connections?

To answer the mentioned-above questions, we present an analytical tool based on the following dimensions: (1) the features of the learning activities that encourage students to connect the school contents and activities and the learning and/or learning experiences they have in the different contexts of activity they participate in; (2) the educational agents involved in the educational practices that can potentially promote these connections; and (3) the tools that are used in the practices and which favor these connections.

Method

This study is part of a broader research project that aims to explore and analyze educational practices that promote personalization strategies for school learning, designed and implemented in eight primary and secondary education centers in different

cities in Spain. The project includes two phases. The first phase of the project aims to describe and analyze personalization practices based on their characteristics. The objective of the second phase is to analyze in depth the learning experiences that students develop inside and outside the school, as well as the meaning and personal value they attribute to these practices.

Specifically, in this article we present some results of the first phase of the project. We carried out an exploratory multiple case study (Yin, 2017) in three secondary education centers that use different strategies to encourage students to establish connections between the learning and/or learning experiences they have in high school and those carried out in other contexts of activity in which they participate. We chose a case study design because the phenomenon of study (personalized learning practices) is absolutely inseparable from their context. This is, from the particular school in which it is implemented. This narrow link makes us discard an experimental design. Moreover, there is limited knowledge and research about the type of personalized practices that we want to study. Therefore, we cannot opt for a single case study, and instead we have conducted a multiple case study (Yin, 2017).

Authors such as Ragin (2011) consider the multiple case study as a contrastive method, since its strategy makes it possible to examine the similar and different patterns between a moderate number of diverse cases. This reinforces analytical generalizations while increasing the robustness and confidence of the conclusions. It is also an exploratory study because we do not know enough about the characteristics of the learning personalization practices to formulate hypotheses. Rather, our study allows us to explore questions and formulate answers with empirical support so that, based on these, we can establish new premises that will require studying more cases to increase

the robustness of the results. Finally, our research has an eminently interpretive purpose and applies a qualitative methodological approach (Willig, 2013).

Participants and Settings

For data collection we intentionally selected three high schools in Catalonia based on two criteria: (1) the implementation of practices for personalizing school learning aimed at helping students to connect learning and/or learning experiences that have taken place at different times and in different contexts of activity; and (2) the willingness of the high school's teaching team to participate in the research.

We define a case as the inseparable pair formed by the personalization practice and the center in which it is carried out. Once the three cases were selected, two groups of students and their main teacher were followed throughout the academic year 2018-19 to observe the details of the implementation of each selected practice in the three high schools. The selection criterion used was the availability and interest of teachers to participate in the research. This section gives a summary of the characteristics of each case:

Case One

Is a public high school located in a small town that offers the four compulsory secondary education courses (12-16 years) and has 269 students and 25 teachers. The center's entire educational project revolves around personalizing school learning and has the 'work plan' as its central axis. The work plan is a document prepared jointly by the student and their tutor at the beginning of the course. It is based on the student's personal learning objectives, their interests and the curricular aspects they want to

improve. Every trimester the tutor, the student and the family review the work plan based on joint reflection on the learning process followed by the student.

The work plan specifies the personal learning itinerary that the student carries out through the five main types of educational activities in which the center organizes the curriculum: action plans, projects, workshops, tutoring sessions, and autonomous work. All the activities are organized in time periods of 1.5 hours and are designed based on two key ideas: first, the idea of a bimodal curriculum, in which all learning has a theoretical and a practical component, and where experiential learning and its application to community life outside the institute are emphasized; and second, attention to the students' individual characteristics to improve their learning-to-learn skills, incorporating their voice in the selection of activities and in the evaluation of these. In all activities, Google Classroom is used to deliver resources, guidelines and share workspaces.

Every year a repertoire of 75 action plans and 11 workshops are offered. students can choose which ones they will take based on their work plans. Specifically, the action plans are blocks of content of 12 hours per week organized in five areas (communication; foreign languages; science, technology and mathematics; social studies, art and music; and physical and kinaesthetic education). The workshops deal with different communication modes (journalism, theatre, photography, programming, etc.), and have a strong practical component that is applicable to the professional world. They are held for three hours a week in different spaces in the center (kitchen, workshop, garden, science and technology laboratories) or in spaces provided by the city council or other entities. Mixed first, second- and third-year students participate in these two types of educational activities.

The other three types of activities (projects, tutoring sessions, and autonomous work) are compulsory and do not affect the work plan. The projects, with a dedication of six hours a week, pose problems that must be addressed in an interdisciplinary way based on the exploration of the immediate environment and service learning with community entities. They generally begin with a ‘happening’ involving a visit from an expert from the local community, a family member or an excursion, which is used to propose the objectives of the project and the expected product. The tutoring sessions are spaces of 1.5 hours a week for working on group cohesion, where issues of the tutorial action are addressed, such as values and coexistence. In addition, students have 4.5 hours a week of autonomous work.

Throughout the week, for 3 hours, there is also more individualized tutoring where students are guided and supported in making decisions about the activities they can choose and in reflecting on themselves as learners. This is achieved with the Lifebook, a Padlet where the students write a weekly journal about the learning experiences they have both inside and outside the high school.

In this center we have followed the personalization practices of two teachers and their groups of 26 students (12-13 years) and 28 students (15-16 years). We have observed all tutoring sessions of both groups and all the weekly teachers’ coordination meetings. In addition, we follow 8 particular action plans and 2 workshops of three students from each selected group.

Case Two

Is a public high school located in a medium-sized town, that offers compulsory secondary education, the two years of non-compulsory high school education and vocational training. It has a total of 465 students and 58 teachers. The center

implements a learning personalization practice in the first year of secondary education (12-13 years) aimed at allowing students to get to know and become more involved in the city where the center is located. This practice takes the form of a project that involved two teachers and 20 students from the first year of secondary school. We particularly follow two groups of students and their two teachers throughout the project, which corresponds to 4 hours of observations per week. The project is managed with the support of Google Classroom, which incorporates the activities and the numerous digital resources that the teachers and students use.

In the first trimester, groups of three or four students participate in different activities aimed at sharing their initial knowledge of the city and deepening and expanding it, as well as learning to use the technological tools that they will employ later.

The second term is dedicated to preparing and developing a gymkhana that consists of a tour of different parts of the city during which students carry out different tasks with the support of mobile devices. This gymkhana is part of a broader national project, the World Mobile City Project (<http://www.wmcproject.org/>). The teachers give each group a pack of five cards showing the places in the city that they have to visit. The groups start their tours by choosing the order of visiting the assigned places and the teachers follow the groups' routes using the Life360 application. Upon reaching each of the locations on the cards, the groups use the QR reader to access information about the location and the task guidelines (answer a question, take a photo or video, etc.). Once the task is completed, they publish the result on Instagram with the appropriate hashtags.

In the third trimester, the project activities revolve around joint work with emblematic entities and associations of the city, in many cases also chosen by the

students themselves. The students carry out two types of activities. First, they do activities in which teachers guide the students' participation in contexts that have a different social and community value (cultural, sports, leisure, etc.). Second, students carry out activities aimed at deepening their knowledge of an entity of particular interest to them. They have a large degree of autonomy in these activities. In this case, it is the students, either individually or in pairs, who contact the entities, carry out video-interviews with those in charge, and later share this work with their classmates and the teacher in the classroom.

Case Three

Is a public high school located in a middle-class neighborhood of a large city, which provides compulsory and non-compulsory secondary education. It has 572 students and 48 teachers. Project work has become the axis around which the institute revolves for 3rd and 4th year students (14-16 years old) with a dedication of 12 hours a week, practically 40% of the school hours. Students carry out two five-week projects in parallel throughout the course. The themes of the projects are very varied and are organized around different areas or fields, such as artistic or musical creation, scientific or social research, programming and design, technological projects, and community service. A good part of these projects involve collaboration with entities outside the institute, most of which are in the neighborhood in which the center is located. Thus, to give some examples, in the area of musical creation we find a project that involves creating a rap to protest against racism, or in the area of technological applications there is a project for studying how to make the education center itself more respectful with the environment.

At three times during the school year, students receive the list of projects that will be carried out during the term, organized into two blocks of areas, along with a brief description of the content that each project deals with. For each trimester, students must select three projects, ordered by preference, from each block. Once the students' preferences have been collected, the teachers organize groups of between 20 and 24 students, trying to respect the students' preferences. If in any case it is not possible to respect their preferences, priority is given to the affected students in the following five-week period of the same trimester or the following trimester.

All projects, regardless of the area or areas to which their content refers, and whether or not they are carried out in collaboration with an external entity, have six characteristics in common. First, projects are presented as an open problem or challenge that students must define, analyze, specify and solve. Second, the projects always involve developing a final product, which can be a constructed object, a presentation, a service, a work of art, a piece of writing or the organization of an event, among others. Third, the projects emphasize communication between students and collaborative work in small groups. Students are encouraged to present their ideas, explain the decisions they have made and the reasons for them, and critically and constructively evaluate the ideas and decisions presented by their peers. Fourth, the use of digital technologies is central to the projects because teachers and students have shared spaces in Moodle and Google Classroom, and use tools to access information sources, make calculations or write texts, take pictures, edit images or videos. Fifth, students are encouraged to disseminate the products they make and explain the process they followed to their classmates and families, as well as on the Internet. Finally, sixth, in all projects the evaluation considers both the process followed and the quality of the final product produced.

In this high school, we observe in detail the practice developed by two class groups of 20 and 24 students (14-15 years) with their respective main teachers and the external agents who were involved in each project over five weeks.

Procedure and Instruments

We established a collaboration agreement with the management teams of the three participating centers in order to carry out the research during the 2018-19 academic year. In the initial meetings, we presented the study objectives and discussed ethical issues regarding confidentiality and the use of data (Willig, 2013).

In all three cases we then systematically collected the documentation related to the planning of educational practices, the activities that the teaching staff and students carried out during the implementation of the practices and the teachers' and students' evaluations. We used four strategies to collect this information: interviews, non-participant observations, questionnaires and analysis of the centers' documents related to each personalized practice. This allowed us to triangulate the data, and thus, give our findings credibility and dependability. The collected data set is presented in Table 1. In that table, a greater number of evidences can be seen in case one because the personalized practice encompasses the entire project of the center, unlike in cases two and three, where the practice is more limited.

[Insert Table 1 near here]

The procedure consisted of collecting all those documents of the high school's educational project and other supporting documents derived from coordination meetings that allowed us to understand the characteristics of the design and implementation of the selected learning personalization practices. We elaborated observation templates to follow the application of the practices in the classroom and to record the decisions made

regarding them in the teachers' coordination meetings. We also collected the products made by teachers and students during the practices. Those documents and observational templates were used to understand the design and implementation of the personalized learning practice.

In addition, we carried out interviews with the teachers involved in the practices at different points in time of the course in order to better understand the decision-making about the design and implementation of activities and obtain their assessment of this process. We also interviewed a small sample of participating students to explore their learning experiences related to the personalization practice analyzed, as well as the learning experiences with which they connected, regardless of the time and place in which they took place. The interviews were conducted by a researcher and a support person, who took notes and checked that all the issues had been addressed. All interviews were audio recorded.

Data Analysis

We have applied a thematic analysis (Willig, 2013) to the corpus of data collected on the instructional design of each personalized learning practice based on three dimensions. The proposal of dimensions emerged from the reviewed literature and our own theoretical framework. The three dimensions are: the features of the learning activities and contents used in the high schools; the participation of the different educational agents; and the tools, both technological and analogue, that promote the connections between students' learning and/or learning experiences. Specifically, we analyzed:

- (1) To what extent learning activities and content are designed to enhance connections between students' learning and/or their learning experiences. The emphasis is on activities and situations in which students connect with the reality that surrounds them and which allows them to observe the complex phenomena of the world in a systemic way, through different interests, perspectives, concepts, materials and artefacts linked to them (Erstad & Sefton-Green, 2013; Gutiérrez, Baquedano-López, & Tejada, 1999; Ito et al., 2013; Moje et al., 2004; Vartiainen et al., 2018). These activities generally require a product or object to be elaborated that intentionally brings into play different subjects, multiple ways of working and different ways of thinking (Akkerman & Bakker, 2011). The didactic strategies that are put in place to carry out these activities are characterized by enhancing experiential, situated and authentic learning (Dewey, 1986; Høgheim & Reber, 2017; Lave & Wenger, 1991; Suchman, 1987; Wong et al., 2015; Walkington & Bernacki, 2014; Wong & Looi, 2011). They are also characterized by having a strong experiential component that connects the cognitive and emotional aspects involved in learning (Cole, 1996; Crespo et al., 2005; González, Moll, & Amanti, 2006; Llopart & Esteban-Guitart, 2018; Rajala et al., 2016; Silseth & Erstad, 2018).
- (2) To what extent the educational agents involved in educational practices encourage students to adopt different roles, perspectives and responsibilities that can help them to establish connections between their learning and/or learning experiences (Akkerman & Bakker, 2011; Erstad & Sefton-Green, 2013; Ito et al., 2013; Rogoff, 2003; Vartiainen et al., 2018; Walker & Nocon, 2007; Wenger, 1998; Wong et al., 2015; Wong & Looi, 2011).

- (3) To what extent are tools (technological or analogue) used to encourage students to build bridges between school and non-school learning and/or their learning experiences. The emphasis is placed on providing students with a varied set of tools that allow them to contribute to carrying out learning activities, including activities aimed at promoting communication among participants, activities for collecting, developing and sharing information, and activities for constructing the product or artefact of the educational activity (Akkerman & Bakker, 2011; Crespo et al., 2005; Gutiérrez et al., 1999; Moje et al., 2004; Walker & Nocon, 2007; Wong et al., 2015; Wong & Looi, 2011).

As shown in Table 2, within each dimension we distinguished subdimensions based on their elements or aspects that are expected to facilitate, promote or enhance the connections between learning and/or learning experiences.

[Insert Table 2 near here]

To illustrate more clearly the presence and weight of the dimensions and subdimensions established for analyzing the three selected personalization practices, we have chosen to represent them graphically. We took into account two criteria for elaborating the graphical representation: (1) the number of activities related to the subdimension with respect to the total activities of the personalization practice; and (2) the time dedicated to the activities related to the subdimension with respect to the duration of the total set of practices. Based on the weighting of the two criteria, we have established three levels to reflect the presence of the subdimensions of each dimension: low (less than 30%), medium (between 35 and 60%) and high (between 65 and 100%).

Results

We now present and illustrate graphically the results of analyzing the design of the personalization practices in each of the three cases based on the three proposed dimensions.

Learning Activities Designed to Foster Connections

[Insert Figure 1 near here]

Figure 1 illustrates the types of learning activities that are designed to enhance the connections between students' learning and/or learning experiences. In all three cases, the most frequently activities designed for this purpose are those based on active and inquiry methodologies, which require interdisciplinary work between subjects; projects that involve participation in community activities and initiatives in the immediate environment; and activities that incorporate the students' interests, preferences and/or personal experiences. The least frequent are learning activities related to participation in global-community activities and initiatives and those aimed at bridging learning experiences that students have had at different times and in different contexts of activity. This last type of activity only appears in one of the cases analyzed.

In all three cases most activities based on inquiry methodologies (learning based on authentic projects, challenges, solving problems or cases, and simulations) formulate open and authentic problems that aim to encourage students to establish connections between knowledge and skills from different subject areas in an integrated way to define, investigate, specify and solve the problem or challenge posed. For example, one project challenges students to design their own Escape Room. For this they visit an installation of this type and have several work sessions with technicians from a company in the region dedicated to this business who guide their work. Another project

asks students whether the Earth's resources are infinite and challenges them to set goals for sustainable development that meets human needs without compromising the future of the planet.

Using the resources available at the local and community levels for working on school contents through outings to entities and associations, visits by community experts to the education center, participation in activities or research work with local entities and services, are also frequent activities in all three cases that provide opportunities for students to make connections between what they do and learn inside and outside the high school. A large part of the topics that are worked on in this project refer to the emblematic places of the immediate environment or to the services and resources of local entities (museums, sports and cultural associations, non-profit associations, etc.). In cases one and three, service-learning proposals are common. These proposals help students to analyze the environmental, educational and social reality of their immediate surroundings from the perspective of one or more curricular subjects, to deepen their knowledge and to propose initiatives for improving these situations. For example, some of these projects focus on the problem of older people living alone, the gentrification of the neighborhood or helping newcomers from other countries, among others.

The learning activities linked to the students' interests and concerns have a medium frequency in cases two and three, and high frequency in case one. In cases one and three students can select the projects in which they participate according to their own interests. The teachers, for their part, strive to develop attractive proposals to interest students in the curricular content, as illustrated by the suggestive titles of the projects: "Truths, lies and statistics", "See, look, imagine", "Are we what we eat?", "Physics for a mission to Mars" and "Is it a small world after all?". When the students

do these projects, they have opportunities to select the topics they want to study in depth, the type of activities they prefer to carry out and the partners who they wish to work with. On the other hand, in case two the choices are more limited and focus on selecting certain topics of interest within the main activity. For example, students can choose to learn more about the functioning and organization of an animal and plant protection association or about the city's mosque, among others. In addition, in case one we find some didactic strategies aimed at adapting the format or the educational materials used in the activities and/or problems to be solved in class, for example, placing the topics in the local context or in the students' daily activities, proposing analysis of songs by popular groups, working on individual or class group conflicts, among others.

In the practices analyzed, case one was the only center that had activities related to entities of the global community environment, and activities related to the students' personal objectives and with explicit reflection on the relationships between students' learning experiences. The activities related to global-community entities mainly concern the high school's participation in exchange networks at the European level. This type of activity promotes the exchange of ideas, procedures and resources between students of different nationalities. A clear example is the eTwinning project, which makes it possible to learn the language and culture of a community in a context of communication and real collaboration to achieve a common goal, providing opportunities for students to relate the learning they achieve in and out of school.

Similarly, only in case one do we find activities linked to the students' personal objectives, their life projects or to aspects they would like to improve, as well as activities aimed at relating the learning experiences that students have had at different times and in different contexts of activity. The first are the most central in the 'work

plan', which, as we pointed out before, guides the student in selecting the activities that will allow them to achieve their personal goals, and also in reviewing them throughout the entire course. It is also common for some workshops to set aside spaces and time to help students reflect on the relationship between the activities they carry out in the workshops and their personal goals. Thus, for example, if a student wants to overcome their stage fright, the reflection is aimed at assessing to what extent the activities, content and skills worked on have been useful for improving this aspect.

Finally, case one uses a virtual learning diary, called the Lifebook, to build bridges between learning experiences that students have had at different times and in different contexts. In the Lifebook, the students explain their personal learning experiences inside and outside the high school, while reflecting on the learning carried out in these contexts and on themselves as learners. It does not have a closed and pre-established structure, so each student can adjust it to their interests, tastes and needs. Thus, many students combine drawings, graphics, videos, music and text, and arrange the journal entries as they want. The teacher scaffolds and encourages reflection about the students' learning and about themselves as learners through dynamics such as using visual metaphors to express how they feel about certain learning, using different resources to elicit reflection (stories with a moral, conceptual or dynamic images of personal knowledge), and using questions to guide reflection (What was your participation in the activity like? What have you learned?), among others.

Educational Agents who Enhance Connections

[Insert Figure 2 near here]

In all three cases, relationships between students and local community agents are promoted more frequently than with other types of educational agents, such as those of the global community or families (see Figure 2).

Cooperative work is generalized in all centers. The students usually work on the activities organized in small heterogeneous groups of the same year-group. However, in case one we also find that a good part of the activities is carried out in cooperative groups made up of students from different ages and courses, and, exceptionally, in some action plans work is done in homogeneous groups according to performance levels. This type of social organization to carry out activities is particularly conducive to students adopting different roles, perspectives and responsibilities that can facilitate them building bridges between their learning and/or learning experiences.

In all three cases, a close relationship is also established with the agents of the local community in the immediate environment to carry out specific activities or longer lasting projects. For example, experts from local entities, such as museum educators, city council technicians or members of associations, are invited to offer initial information on a certain project topic, to carry out an assignment or ask the students to solve a specific situation, or to be interviewed to obtain information on a topic the students are working on. In general, this type of relationship places the students in a different role from the one they play in the classroom, and also obliges them to assume the responsibility of establishing a framework of cooperation with the agents of the external entity to resolve the project or proposed problem. These situations can give students a contrast between the teachers' perspectives and knowledge and the school contents and those of the agents of the local community, and thereby encourage them to make connections between their learning and/or learning experiences.

In addition, in case one we find direct participation of families in academic activities, either to teach tools and procedures of a certain community of experts (carpenters, builders, social workers, etc.) or to help in the development of their children's work plans and to look for strategies to help their children achieve their personal learning goals. In both cases, the participation of families in school activities is an opportunity to build bridges between what students do and learn in school and what they do and learn outside of school. In case one, we also find, although more occasionally, the participation of agents of the global community such as artists, writers and scientists, who reside in other parts of the country and who help students to go deeper into specific aspects of the projects they are working on, creating situations similar to those that we indicated for the agents of the local community.

Mediating Tools that Enable Connections

[Insert Figure 3 near here]

The three cases very frequently use tools and artefacts that can facilitate learning bridges between students' learning and/or learning experiences inside and outside of school (see Figure 3), especially using digital information and communication technologies.

Different types of tools are used in all three centers to establish communication channels between students and between them and the educational agents who participate in learning activities; from the most common ones, such as email and video and telephone calls, to more specific ones linked to certain projects. Thus, for example, in the gymkhana of case two WhatsApp is used to establish more fluid communication between students and teachers while they visit different places in the city. They also use

Instagram, which includes the possibility of geolocating the photos students take, which facilitates follow-up by the teaching staff.

Laptops, tablets and even, in some cases, smartphones are available to students in all activities that take place in the three high schools. These devices are used intensively to search for information or resources on the Internet (consult Wikipedia or tutorials on YouTube, capture images, etc.), make calculations, write texts or collect field data, as well as to take photographs and videos for the final product or to document the progress of the projects. Both students and teachers have virtual workspaces, either in Moodle, Google Classroom, Google Drive and/or Padlet, which they use as a repository to share files or to collaboratively create presentations and texts or edit images, audios and videos. The intense use of devices in the classroom encourages students to extend their use to other areas outside of school, making it easier for them to build bridges between their learning experiences, regardless of where or when they take place.

All three cases frequently use applications and software such as geolocation programs (Google Maps, My Maps), programming (Scratch, MIT App Inventor, Processing), and digital design (Rhino 3D, Arduino), among others. Physical tools typical of professional workshops are also used (saws, drills, paints ...) or professional digital tools (SketchUp, Photoshop, 3D printers, video mapping, etc.). Unlike more traditional school tasks, the use of these types of tools makes it possible to create authentic environments that can empower students to relate the work or projects they carry out in education centers to the social practices and artefacts characteristic of the community in which they participate and learn.

Discussion

Our proposal of analytical tool is located within sociocultural approaches. From our point of view, what is essential for learning is the continuity between the students' learning experiences rather than the contexts of activity and the moment in which students have carried out those learning (Arnseth & Silseth, 2013; DeMink-Carthew et al., 2020; Engel & Membrive, 2018; Erstad et al., 2017). The study findings evidence the value of the perspective that we have used here to identify, describe and analyze the design of personalization strategies that promote the connections between students' learning and/or learning experiences inside and outside the school. It has also been possible to empirically demonstrate how each case being studied develops a set of specific strategies to achieve this goal.

Thus, our results demonstrate the viability of adopting a multisystemic perspective in the study of learning (Bronkhorst & Akkerman, 2016) to understand how the connections between the students' learning and/or their learning experiences are promoted in instructional designs. In our case, the multidimensional perspective proposed adopts three key dimensions, which, although they have been considered in the literature, have not always been analyzed jointly: the learning activities and contents that are designed to encourage students bridging learning; the educational agents that enhance these connections; and the mediating (technological or analogue) tools used. In our opinion, the analytical tool itself is a useful contribution of this paper: we have not found any previous proposals in the literature of an analysis based on the framework of the personalization of school learning.

Specifically, we identified the diversity of elements that the analyzed cases offer to favor building bridges between the students learning and/or learning experiences in the different contexts of activity (Erstad & Sefton-Green, 2013; Ito et al., 2013). The three high schools studied planned learning activities that connect school content with

other content and activities from contexts close to the students. They use active and inquiry methodologies and take advantage of educational resources available in the students' immediate environment. Less frequently, and only in some cases, they connect students' personal goals and learning experiences with school content, and design connections with available and accessible learning resources and opportunities on the Internet. Likewise, they use, with greater or lesser intensity, the participation of different educational agents, such as classmates, agents from external entities in the local community and, in some cases but to a lesser extent, the family and other agents of the global community, to promote establishing connections. Finally, various, particularly digital, resources and tools are available to students to be used for building bridges between the students' learning and/or learning experiences. Together, these results highlight the numerous efforts that the schools make to promote learning with meaning and personal value for students (González Rey, 2016; Roth & Jornet, 2016).

Even so, and despite these efforts, the multidimensional proposal applied here also allowed us to detect some axes that need further work to increase the possibility of building bridges between students' learning and/or their learning experiences. Our data suggest that the personalization strategy based on establishing connections between students' learning and/or learning experiences that take place in school and non-school contexts is connected in different ways (and to different degrees) with other learning personalization strategies, such as decision-making, working around the students' interests, and reflecting on the learning carried out and on oneself as a learner. These elements are considered central to promoting the personal meaning and value that is attributed to learning (Bray & McClaskey, 2015; Coll, 2016, 2018).

Firstly, high schools design these strategies to build bridges between the students' learning and/or learning experiences that take place inside and outside the

school, and they strive to incorporate the students' interests, for example, through contextualized instruction (Rajala et al., 2016; Silseth & Erstad, 2018) or by using the funds of knowledge of the students and their families (González, Moll, & Amanti, 2006; Llopart & Esteban-Guitart, 2018). These initiatives are limited to identifying situations or examples from the students' daily lives that originate outside of school and connecting them with the school learning activities. They take advantage of the learning resources and opportunities which are available in the immediate environment, or place emphasis on learning content that is socially and culturally relevant to students through participation in community activities and initiatives. However, only on very few occasions, such as with the Lifebook used in case one, do they explore the learning experiences that students have due to their participation in these activities and situations. Thus, we believe that to achieve the goal of personalization it would be necessary to go one step further and incorporate specific spaces and times in the instructional designs for identifying, reflecting and assessing (both at the individual and collective level) the significant learning experiences for students regardless of the activity context in which they took place. This recommendation is important in cases two and three, in which teachers could introduce different questions aimed at reflecting on the learning experiences that students built as a result of their participation in school activities that seek to establish connections between their learning and/or learning experiences outside the school. Those activities would help students to develop skills that allow them to build bridges between their learning experiences, and to find the common thread of their learning pathways woven around their interests and personal goals (Arnseth & Silseth, 2013; Engel & Membrive, 2018; Erstad et al., 2017).

Secondly, we believe that the connection between different personalization strategies can promote the development of learning with greater meaning for students.

From our point of view, the teaching actions that place reflection at the center of the design of the learning activities are especially important and should be implemented in all three cases. The instructional designs that we have analyzed seem to suffer in general from the lack of strategies aimed at making connections between students' learning experiences, while the literature highlights that this is a key element for promoting relevant, deep and meaningful learning that has personal value for the students (DeMink-Carthew, Netcoh, & Farber, 2020; Dumond et al., 2010; OECD, 2006; Sawyer, 2014). Helping students to reflect on their learning and learning experiences would allow them to become more aware of what, with whom and in what way they learn in the different contexts of activity in which they participate during their lives. In all analyzed cases, in which inquiry methodologies are used to foster connections, it would be advisable to introduce within the instructional design specific moments directed to students' reflection on the relationship between the contents of the project they are developing in class and other learning experiences they have learned outside the school. In our opinion, it is not enough to design activities that connect the contents and educational activities with the students' realities, it is also necessary to make these connections explicit and encourage students to reflect on them so they are able to relate the learning experiences they have independently of the place and time in which they occur (Erstad & Sefton-Green, 2013; Ito et al., 2013; Wong et al., 2015; Wong & Looi, 2011).

Thirdly, we believe that reflection on the connections established between the learning experiences that students have in different contexts of activity helps them to learn things about themselves as learners (DeMink-Carthew, Netcoh, & Farber, 2020; Falsafi & Coll, 2011). It would be advisable, in cases two and three, to introduce the use of learning diaries such as the Lifebook used in case one, that allow different formats

(text, drawing, image or video) so that each student could specify their reflections on themselves as learners according to their preferences. Instructional designs focused on personalizing learning should not ignore this aspect, but rather promote activities for students to reflect on how to approach school and non-school learning activities and tasks, reflect on the most effective strategies for acting appropriately in each context, reflect on their strengths and aspects that need to be improved as learners, and, ultimately, to ensure the acquisition and development of transversal skills that allow them to act effectively in the information society (The Aspen Institute task force on learning and Internet, 2014).

Limitations and Future Research

Undoubtedly, determining how personalization strategies can be connected to help students increase the meaning of their learning is a challenge to be met in future research. On one hand, our work has focused on studying the strategies that the different centers design to favor making bridges between learning experiences inside and outside of school. However, there is a double limitation of our study that needs to be addressed by future research. The first limitation points at the challenge to research how the previously established designs of personalized practices unfolds throughout the education process and to what extent the potentialities of the activities, educational agents and tools are materialized to help students establish connections between what they do and learn in the education center and outside it. The second is to research to what extent the real application of these personalized learning activities favors students making bridges between their learning experiences, and to better understand how this is related to developing school learning with greater personal meaning and value. This points to the need to complement the study presented in this work with the results of

phase 2 of the research. The analysis of the students' perspective is a crucial aspect to be able to design truly authentic and relevant environments for their learning (Weninger, 2017).

On the other hand, another future line of research is the analysis of how the students' motives and interests are taken into account and how they are constructed (and reconstructed) in the framework of teaching and learning activities conducted by schools to promote connections between the students' learning and/or learning experiences that take place in multiple contexts of activity. As Walkington and Bernacki (2020) point out, there is a lack of research that determines in a rich and integrated way what happens in classrooms when personalization strategies for school learning are implemented. For this reason, we believe that our proposal of dimensions could be refined based on new research that focuses on the analysis of interactivity and educational discourse in classrooms.

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Declaration of interest and statement

We have no conflicts of interest to disclose.

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Table 1*Body of Data Collected*

Type of data		Case One	Case Two	Case Three
Interviews	Teaching staff	8	6	5
	Students	14	6	7
Observations	Narrative records of coordination meetings	18	21	8
	Narrative records of classroom observations	32	5	24
Documents		40	27	16

Table 2

*Dimensions and Subdimensions of the Analysis of Learning Personalization Practices
Aimed at Connecting Students' Learning and/or Learning Experiences*

Dimensions	Subdimensions	Operational definition
Teaching and learning activities and content	Activities based on solving authentic problems	Teaching and learning activities that require using content and skills approached from different subjects to analyze, solve and/or reflect on the students' authentic and everyday problems. The didactic strategies are generally based on inquiry methodologies such as learning based on authentic projects, challenges, solving problems or cases, and simulations.
	Activities promoted by entities of the local community environment	Teaching and learning activities related to content that is socially and culturally relevant for students and that requires knowledge or participation in community activities and initiatives in the immediate environment. The didactic strategies are generally based on outings to socio-institutional entities in the local community environment, visits by experts from the community or exploration of problems that

are socially and culturally relevant for students and that require participation in community activities and initiatives, such as service learning projects, civil or cultural initiatives.

Activities promoted by entities of the global community environment

Teaching and learning activities related to content that is socially and culturally relevant for students and that requires knowledge or participation in global-community activities and initiatives. The didactic strategies are generally based on participation in international projects or networks, learning communities, etc. such as, Comenius, Erasmus +, and eTwinning.

Activities related to the students' interests

Teaching and learning activities related to the students' concerns and daily life. The didactic strategies generally incorporate the students' interests, preferences and personal experiences into the ordinary classroom activities, for example, the adaptation of the materials and activities/learning tasks.

Activities linked to the students' personal objectives

Teaching and learning activities linked to the students' personal objectives, their life projects or aspects that they want to improve. The didactic strategies are generally based on incorporating specific times and spaces for reviewing, reflecting and assessing, both individually and collectively, significant learning experiences for students regardless of the activity context, school or non-school, in which they take place, such as, for example, didactic contract and personal learning plans.

Activities related to students' learning experiences

Learning activities aimed at relating the learning experiences that students have had at different times and in different activity contexts. The didactic strategies are generally based on incorporating specific times and spaces for students to reflect on their way of approaching school and non-school learning activities and tasks, such as, for example, the preparation of learning diaries or personal learning environments.

Educational agents

Peers

Teaching and learning activities that promote cooperative learning among

students as a means of enhancing the connections between their learning and/or learning experiences.

Family

Teaching and learning activities that promote family participation in activities with students in the classroom as a means of enhancing the connections between learning and/or learning experiences.

Local-community agents

Teaching and learning activities that promote establishing relationships with agents, entities or services of the local community (sports, social or cultural entities, and relationships with community experts, for example: city council technicians, local police, etc.) as a means of enhancing the connections between students' learning and/or learning experiences.

Global-community agents

Teaching and learning activities that promote establishing relationships with agents of the external community (for example: an expert from another city, region or country, students from other places or countries, etc.) as a means of enhancing the

		connections between the students' learning and/or learning experiences.
Technological or analogue tools	To communicate with others	Use of tools for communication between the different agents involved in school teaching activities, between teachers, teachers and students or external agents (for example: WhatsApp, email, telephone) as a means of enhancing the connections between the students' learning and/or learning experiences.
	To search for information	Use of tools to search for information (for example: Google, Pinterest, YouTube, dictionaries, journals) as a means of enhancing the connections between students' learning and/or learning experiences.
	To share information	Use of tools to share information with others, or as a repository of school activities (for example: Google Classroom, Padlet, Moodle, Drive) as a means of enhancing the connections between students' learning and/or learning experiences.
	To elaborate or construct a product or artefact	Use of tools to design and/or construct the product of the learning activity (for example:

Google Maps, Scratch, PowerPoint, Tiki-Toki, Lego or meccano-type construction games, etc.) as a means of enhancing the connections between students' learning and/or learning experiences.

From different expert communities for developing or constructing a product or artefact

Use of tools from a community of experts on a topic or in a field of knowledge for designing and/or building the product of the learning activity (for example: Photoshop, Autocad, maps, plans, apps, dioramas, carpentry tools) as a means of enhancing the connections between students' learning and/or learning experiences.

Figure 1

Features of the Personalized Learning Activities and Content that Promote Connections between Student's Learning and/or Learning Experiences

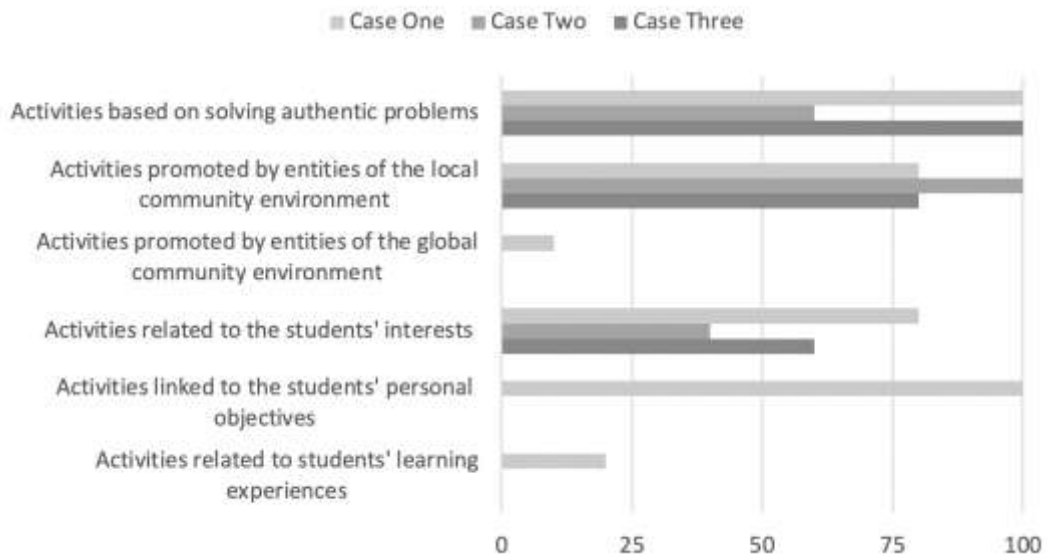


Figure 2

Agents who Encourage Making Connections between Students' Learning and/or Learning Experiences

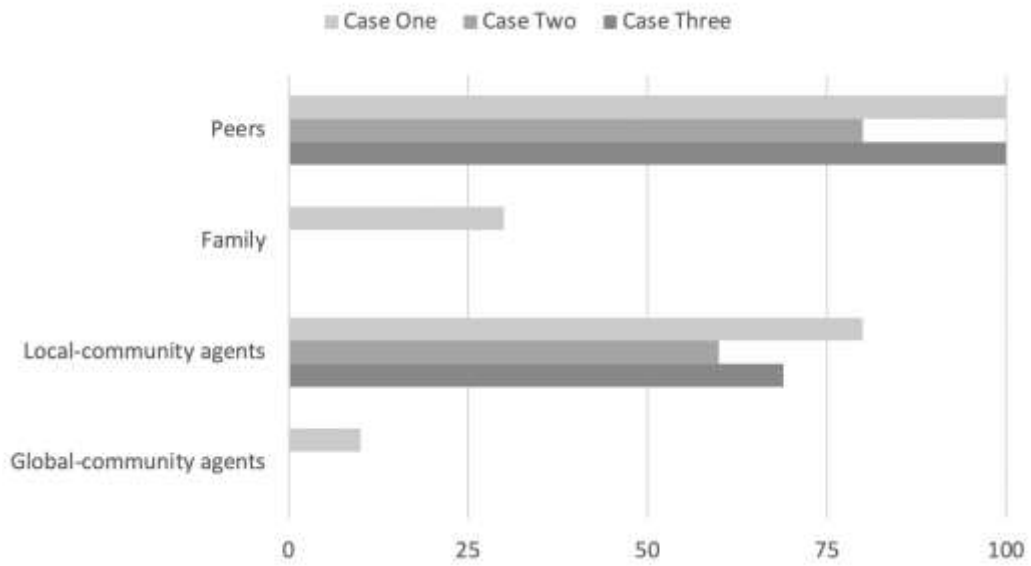


Figure 3

Tools for Promoting Connections between Students' Learning and/or Learning Experiences

