The construction of useful human capital for student entrepreneurs: the role of education and life experience

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Résumé :

Cet article vise à caractériser le rôle de la formation générale, de la formation entrepreneuriale et de l'expérience de vie sur la construction des connaissances, des compétences et des savoir-être mobilisés dans les projets entrepreneuriaux des étudiants. Il identifie les caractéristiques du profil de l'étudiant et du projet entrepreneurial qui influencent cette construction. Il s'appuie sur une base de données unique recueillie par questionnaire en auprès de 210 étudiants entrepreneurs inscrits au sein de Pôles Étudiants pour l'Innovation, le Transfert et l'Entrepreneuriat (PEPITE) en France entre 2014 et 2021. Cette recherche caractérise le capital humain général et spécifique construit par les étudiants entrepreneurs et leur mobilisation dans le projet entrepreneurial. Une classification ascendance hiérarchique est réalisée afin de mettre en avant la diversité des situations et proposer une typologie de celles-ci. Nous identifions cinq classes de situations caractérisées par l'utilisation du capital humain général et spécifique dans le projet entrepreneurial, les caractéristiques des étudiants entrepreneurs et leurs projets entrepreneuriaux. Nos résultats montrent les facteurs propres aux étudiants entrepreneurs pour discuter de la construction du capital humain général et spécifique mobilisés dans les projets entrepreneuriaux.

Mots-clés : Entrepreneuriat académique, formation entrepreneuriale, capital humain général, capital humain spécifique, entrepreneuriat étudiant

The construction of useful human capital for student entrepreneurs: the role of education and life experience

1. INTRODUCTION

The building of entrepreneurial ecosystems conducive to student entrepreneurship has spread all over the world. It has become an important challenge for regional actors and higher education institutions encouraged by educational policies, in response to the belief that entrepreneurship stimulates economic growth (Wright et al., 2017; Theodoraki and Messeghem, 2015). The aim of entrepreneurship education programs is to develop the human capital of student entrepreneurs (Hahn et al., 2017; Gibb, 1993). We define the human capital of student entrepreneurs as the set of skills, knowledge (Ucbasaran et al., 2008; Becker, 1964) and personal abilities (Santos et al., 2020; Hahn et al., 2017) accumulated through schooling, one-job-training, and other experiences all along life.

In the field of student entrepreneurship, several contributions investigate the influence of entrepreneurship education on student human capital, entrepreneurial intention, ability to identify opportunities and success of entrepreneurial projects (Matricano, 2020; Wegner et al., 2019; Passaro et al., 2018) but few focus on the way human capital is built and used in entrepreneurial projects. However, entrepreneurs can have accumulated knowledge and previous skills during training and previous experiences (Cope, 2005; Politis, 2005; Minniti and Bygrave, 2001) that can be mobilized in their project. Further research is needed to know how students assemble and develop their human capital, through general and entrepreneurial education, professional and personal experience (Matt et Schaeffer, 2018; Hahn et al., 2017). To contribute to fill this gap, the aim of this paper is to answer to the following questions: How student entrepreneurs construct human capital mobilized in student entrepreneurial projects? Which contingent factors (profile of students and features of entrepreneurial projects) influence this construction?

To characterize the effective role of human capital and the way is it built, we follow the theory of human capital (Unger et al., 2011; Becker, 1964) and distinguish general human capital accumulated through general education and professional or personal experience (GHK), and specific human capital (SHK) accumulated through entrepreneurship education or experience related to entrepreneurship. We have used a survey compiling the answers of 210 student entrepreneurs, about the knowledge, skills, and behavioural abilities they currently use in their entrepreneurial projects, the way they develop them and the usefulness of

Entrepreneurship Education (EE). The structure of the article is: a literature review about the construction of the human capital of student entrepreneurs (cf. *2. LITERATURE REVIEW: GENERAL AND SPECIFIC HUMAN CAPITAL OF STUDENT ENTREPRENEURS*), the methodology and sample used (cf.*3. METHODOLOGY*), the results (cf. *4. RESULTS*), and a discussion about the results (cf. *5. DISCUSSION*).

2. LITERATURE REVIEW: GENERAL AND SPECIFIC HUMAN CAPITAL OF STUDENT ENTREPRENEURS

2.1. ENTREPRENEURSHIP EDUCATION

Entrepreneurship Education (EE) approaches are conceived as the acquisition of entrepreneurial capabilities through the development of human capital (Surlemont and Kearney, 2009; Verstraete and Fayolle, 2005). Initially, the focus was on educating students about entrepreneurial careers and developing the skills necessary to start businesses and to identify and exploit entrepreneurial opportunities (Aldrich 1999; Gartner, 1993). In line with this approach of EE, many higher education institutions have developed entrepreneurship training programs and created entrepreneurship centres, incubators, business incubators, and coaching facilities (Verzat and Fayolle, 2013; Gibb, 1993). Within the last decade, the objective of EE was broadened to include the development of individuals' ability to be entrepreneurial in contexts that are not necessarily those of business creation. Entrepreneurial training then aims at developing entrepreneurial spirit (Gasse, 2011; Verzat, 2015). Entrepreneurial spirit corresponds to mental and identity processes leading to project, act, and think as entrepreneurs (Verzat and Fayolle, 2013). EE introduces learning to promote the development of entrepreneurial behaviour such as autonomy, risk-taking, critical thinking, self-confidence (Verzat, 2015; Leitch, et al., 2012; Gasse, 2011; Léger-Jarniou, 2008). EE encompasses courses, programs of coaching, workshops on specific subjects and situational settings that aim at developing entrepreneurial experience (Neck and Greene, 2011). Entrepreneurial learning is an experiential process in which entrepreneurs learn by doing (Neck and Greene, 2011). Entrepreneurial learning requires theoretical knowledge but also utilization, application, and action (Neck and Greene, 2011). Entrepreneurial competencies, such as entrepreneurial knowledge, skills and behaviours are developed during entrepreneurial experience (Gartner, 1988). In developing more practical courses, entrepreneurial training supports the development of entrepreneurial competencies and entrepreneurial spirit. Thus, the expected effects of EE can only be partially assessed by the number of businesses created by student entrepreneurs.

In our research, we focus on the last approach on EE. We choose to approach the effect of entrepreneurship training through the perceived usefulness of the knowledge, skills, and

behaviour abilities of student entrepreneurs for the projects they are working on. Our approach leads us to characterize the respective contributions of general education, personal and professional experience, and Entrepreneurship Education (EE), to the development of the student entrepreneurs' human capital. One challenge of this approach is the development of human capital transferable to beneficial activities to society other than business creation.

2.2. HUMAN CAPITAL AND EDUCATION

There is no consensus in literature about the definition of human capital (Nafukho et al., 2004). Therefore, there is a need to clarify this notion before characterizing the impact of experience and education on the useful human capital for student entrepreneurs. The notion of human capital is not recent. It already appears in the work of Walsh (1935) and its use has become widespread since the 1960's, when human capital was identified as the residual factor explaining economic growth, beside the traditional main factors of production, i.e., capital, labor, land and management (Krueger, 1968, Schultz, 1961). Arrow (1962) introduces the concept of learning by doing in the endogenous growth theory, to characterize the role of the increase of productivity through practice in the economic growth. In continuity, Lucas (1988) adopts the concept of human capital to explain increasing returns embedded in human activities. Becker (1964) develops the theory of human capital to estimate employees' income distribution from their investments in human capital. Becker (1964) defines human capital as the set of productive capacities that an individual acquires through learning processes that lead to accumulate general and specific explicit and tacit knowledge (Polanyi, 1967). The tacitness of knowledge refers to the accumulation of uncodifiable skills through learning by doing (Arrow, 1962).

After the 1960s, the notion of capital applied to many kinds of factors involved in economic activities. Beside human capital, notions such as financial capital, intellectual capital, relational capital, social capital, innovation capital, commercial capital emerged (Edvinsson, 1997). The boundaries between these notions are almost fuzzy. Depending on the field of research, the notion of human capital encompasses or not, several dimensions of the capital attached to the individual and profitable in productive activities. As many authors (Unger et al., 2011, Ucbasaran al., 2008; Becker, 1964) we characterize student human capital by the intellectual and behavioural specificities of individuals.

Student entrepreneurs' human capital does not result only from entrepreneurship education. It also results from general education, professional and personal life experience. To identify the human capital resulting from entrepreneurship, several authors (Estrin et al., 2016; Unger et al.,

2011) apply the distinction made by Becker (1964) to the entrepreneurial field. Becker (1964) distinguishes two types of human capital according to their transferability: General Human Capital (GHK) and Specific Human Capital (SHK). GHK is mainly accumulated through general education, professional and personal experience and is transferable across a variety of industries and occupations. Education transfers explicit knowledge while experience transfers tacit knowledge (Davidsson et Honig, 2003). SHK corresponds to a capital for which the derived value is specific to a context. Specific explicit and tacit knowledge accumulated are difficult to transfer to another context.

In the entrepreneurship field, GHK contains human capital acquired through task not related to entrepreneurship (Estrin et al., 2016; Unger et al., 2011). SHK corresponds to human capital acquired through entrepreneurial experience and education such as scan environmental, select, and exploit opportunities, organization, management, and leadership (Shane and Venkataraman, 2000; Chandler et Jansen, 1992). The ability to pursue an entrepreneurial activity is influenced by the interaction between tacit and explicit knowledge (Davidsson and Honig, 2003). Many competencies corresponding to a set of knowledge, skills, and behaviours (Le Boterf, 1994) are associated to entrepreneurship (Brenet et al., 2017) such as entrepreneurial competencies, business management and competencies, human relations competencies, financial competencies, etc. (Mitchelmore and Rowley, 2010; Loué and Laviolette, 2007). Ucbasaran et al. (2008) define entrepreneurs' GHK as resulting from education and work experience and SHK as being based on managerial capabilities, entrepreneurial capabilities, technical capabilities, and business ownership experience. However, some knowledge or abilities can be developed both by general education and entrepreneurship education, and then it could be simultaneously a part of general and specific human capital. For example, one can develop management project knowledge and abilities through general and entrepreneurship education. The more students advance in their studies, the more they specialize and develop specific knowledge or skills that can be used in an entrepreneurial project (Hayter, 2016b). In this perspective, GHK and SHK are characterized by criteria that are not exclusive from one another. It appears preferable to distinguish GHK from SHK by the vectors of development of human capital rather than by type of knowledge, skills, and personal abilities within human capital.

We will therefore retain a definition of general and specific human capital based on the criterion of the vector through which it was developed. We distinguish two kinds of vectors of development of human capital: the first is general education, personal and professional

experience, and the second is EE and entrepreneurial experience. In line with previous works (Unger et al., 2011; Becker, 1964), we define student General Human Capital (GHK) as the part of human capital developed through schooling, general education, personal and professional experience transferable to all domains with no specific link to an entrepreneurial project. Specific Human Capital (SHK) corresponds to the part of human capital related to entrepreneurial projects. In student entrepreneurship field, young entrepreneurs have little professional, entrepreneurial experience, and acquire few human capitals outside general education (Delanoë-Gueguen, 2015, Leyronas and Loup, 2015). Their SHK is mainly accumulated through entrepreneurial training that develop experiential learning by making them work on projects (Verzat and Fayolle, 2013; Neck and Greene, 2011). We define SHK as the set of knowledge, skills and behaviour abilities developed by student entrepreneurs through the voluntary participation to entrepreneurship educational programs.

Many contributions investigate the influence of EE and human capital on entrepreneurial intention, ability to identify opportunities and success of entrepreneurial projects (Matricano, 2020; Wegner et al., 2019, Passaro et al., 2018, Aldrich et Yang, 2014). Unger et al. (2011) consider that SHK is all the more important for success. Estrin et al. (2016) highlight the importance of SHK in commercial entrepreneurship and of GHK in social entrepreneurship. However, we know little about the way student entrepreneurs build and mobilize their human capital. How do student entrepreneurs construct human capital mobilized in student entrepreneurial projects? Which contingency factors (profile of students and features of entrepreneurial projects) influence this construction?

The originality of our research is to identify human capital useful to student entrepreneurs in their entrepreneurial project. The distinction of different human capital categories based on the vectors of development allows us to characterize the contribution of general education, personal and professional experience, and EE on the construction of human capital useful to student entrepreneurs.

3. METHODOLOGY

In this section, we present the data collection, the main variables used and their construction, the main features of our sample and the processing of data.

3.1. DATA COLLECTION

The empirical analysis is based on an original and unique database built from an online survey, sent to student entrepreneurs involved in the French PEPITE (students' centres for innovation transfer and entrepreneurship) program, between 2014 and 2021. This program

results from a national initiative that aims at supporting the development of entrepreneurship in higher education. 33 PEPITE centres have been created since 2014 by the French Ministry of higher education, research, and innovation (Ministère de l'Enseignement Supérieur, de la Recherche et de l'Innovation). All students in French universities, in any fields and any levels, can benefit from the support of these centres to build their own entrepreneurial project. They benefit from a specific status called student entrepreneur (in French Étudiant Entrepreneur) that gives them access, beside the disciplinary program they follow at university, to a diversity of services or facilities such as coworking spaces, entrepreneurial courses, workshops, coaching sessions, financial supports, schedule arrangements. The enrolment in a PEPITE centre is not mandatory and results from the willingness of students to participate in the program.

The managers of 10 PEPITE centres relayed our online survey by e-mail to the student entrepreneurs enrolled or having been enrolled in the program. We collected the data during two periods, from December 2019 to March 2020, and from March to April 2021. Reminders have been sent to student entrepreneurs. We collected 210 responses.

3.2. MEASURES: DIMENSIONS AND VARIABLES

Our survey is structured around four main dimensions: (1) the identification of the part of GHK (knowledge, skills, and behavioural abilities) considered as useful in the entrepreneurial project; (2) the measure of the perceived usefulness of Entrepreneurship Education (EE) on the development of SHK; (3) the profile of student entrepreneurs; and (4) the features of the entrepreneurial projects. *Table 1* represents the four dimensions, the variables, and their modalities.

Table 1 : Dimensions, variables, and modalities

Dimensions	Variables	Modalities
Fields of knowledge, skills and behaviours used in project development of useful General Human Capital (GHK)	Law Arts Sciences Management Finance Behavioural abilities	Same modalities for each variable: • unused (not used in the project) • educ (used and acquired through general education) • noeduc (used and acquired through experience) • educ_noeduc (used and acquired through both education and experience)
Perceived utility of Entrepreneurship education (EE) on the development of Specific Human Capital (SHK)	EK: Entrepreneurial Knowledge ES: Entrepreneurial Skills EB: Entrepreneurial Behaviours	Same modalities for each variable: • Likert scale from 0 to 6
Profile of the student entrepreneur	Gender	Female ; Male
	Age	18 to 22 ; 23 to 26 ; 27 and more
	Education level	College degree; Bachelor degree; Master degree; Doctorate

	Education field	• Arts, Letters and Social Sciences • Business, Management, marketing, communication • Engineering Sciences and Technologies • Health, Paramedical, Social, Life and sport sciences • Law, Economics
	Other Entrepreneurship Education (EE)	• No; Yes
	Commercial motivation	• No ; Yes
Feature of the project	Abandonment of the project	• No ; Yes
	Project phase	• Ideation phase • Feasibility research • Research and development phase Commercialisation_Industrialisation
	Size of team	• 1 ; 2 ; 3 ; 4 ; 5 and more
	Years in entrepreneurial centre	• >1 • ≤1 Year

We chose 15 dimensions to characterize the General Human Capital (GHK) of student entrepreneurs built through general education and life experience. Among these variables, 10 characterize fields of knowledge. We considered life sciences, chemistry, mathematics, and physics identified as important sources of innovation in the literature (Nambisan et al., 2019; Link et al., 2007; Klevorick et al., 1995). We also included design and arts as fields of knowledge being important sources of entrepreneurial opportunities (Gunes, 2012), and obviously law and management which are directly related to the fields of entrepreneurial skills (Verzat, 2015; Loué and Baronet, 2015). Because general education also contributes to the development of skills and attitudes (Gohier, 2006), we also introduced some variables characterizing entrepreneurial skills and attitudes (Référentiel Esprit d'Entreprendre, 2020; Verzat, 2015; Loué and Baronet, 2015; Léger-Jarniou, 2008) that can be developed by general education: communication, project management, organisation, teamwork, autonomy, and critical thinking. Many other variables could be considered as relevant. In order to control the length of the questionnaire that would have a negative effect on the response rate, we had to choose a few of them to characterize the ability to act, to cooperate with others, to be autonomous and to develop a critical mind, considered by Gohier (2006) as the pillars of knowledge.

Because some dimensions were systematically associated in the responses (communication, project management, organisation, teamwork, management) we gathered them in a larger variable called 'management'. In the same logic, we gathered autonomy and critical thinking in a larger variable called 'behavioural abilities' and design and art in the variable 'art'. We gathered mathematics/statistics, physics, chemistry, life science in a single variable 'sciences',

because the multiplicity of variables characterizing scientific knowledge gives an overweight to this field in the analysis. We let 'Finance' and 'Law' as specific fields of knowledge (cf. *Table 2*).

Table 2: Measures of GHK

Variables	Law	Arts	Sciences	Management	Finance	Behavioural abilities
Dimensions	Law	Arts Design	Mathematics/statistics Physics Chemistry Life science	Communication Project management Organisation Teamwork Management	Finance	Autonomy Critical thinking

For each of the 15 dimensions characterizing GHK, we asked student entrepreneurs if it was useful to their entrepreneurial project. In addition to identifying useful knowledge, we introduced questions about the sources of this useful human capital. We proposed them to choose one or several modes of acquisition among these 6: schooling, internship/work experience, doctorate/post-doctorate, professional activities, leisure activities and one-time training. Finally, we defined three modalities to characterize the source of useful GHK: 'educ' for schooling, and doctorate or post-doctorate experience, 'noeduc' for life experience (internship, professional activities, hobbies, one-time training), and educ_noeduc if both were relevant (cf. *Table 1*).

We chose 10 dimensions to characterize the Specific Human Capital (SHK) of student entrepreneurs. Several researches focused on the identification of explicit and tacit knowledge, skills, and personal abilities that EE aims at developing (Loué and Baronet, 2015; Michelmore and Rowley, 2010; Loué and Laviolette, 2007). We considered the works of Verzat (2015) and Fayolle and Verzat (2013) to select the main ones, gathered in three variables. We defined EK (Entrepreneurial Knowledge) for market and business model knowledge; ES (Entrepreneurial Skills) for communication, marketing, teamwork and EB (Entrepreneurial Behaviour) for the ability to start a business, creativity, confidence, attitude towards risk and proactivity. *Table 3* shows the reliability of EK, ES and EB through Cronbach's alpha.

Table 3: Indicator of the quality of measures of SHK

Variables	EK	ES	EB
Dimensions	Market knowledge Business model	Communication Marketing Teamwork	Start a business Creativity Confidence Risk taken Proactivity
Cronbach's alpha	0,857	0,771	0,861

For each of the 10 dimensions of SHK, the questionnaire asked students to evaluate the usefulness of EE. We chose a Likert scale from 0 to 6 to allow respondents to express their

opinion through a degree of agreement (Baumard et Ibert, 2007). 0 indicates that EE doesn't contribute to the development of the specific dimension of SHK. For each variable EK, ES and EB, we calculated the average score obtained for the relevant dimensions. Because the aim was to conduct a hierarchical classification, we transformed continuous variables into qualitative variables. Because our sample was not very large and we had a high number of variables (19), we chose to consider only two modalities to characterize the usefulness of EE. We then defined two modalities characterizing the usefulness of EE for EK, ES and EB: 'low' if the score was from 0 to 2.9, and 'high' if it was from 3 to 6.

We used 6 variables to characterize the profile of student entrepreneurs: gender, age, education level (college, bachelor or master degree, doctorate), education field (arts, business, engineering Sciences, health, law), participation to another EE program and commercial motivation.

We used 4 variables to characterize the entrepreneurial project. We asked them if they have or not abandoned their project, the phase of their project (ideation, feasibility, research and development or commercialisation/industrialisation), the size of the entrepreneurial team and the number of years spent in the PEPITE centre.

3.3. SAMPLE

210 student entrepreneurs answered the whole questionnaire. The main features of the sample are presented in *Table 4*.

Table 4 : Feature of sample

			Effective (N =210)	**Percentage (%)**
PROFILE OF STUDENT	Gender	Female	74	35
		Male	136	65
	Age	18 to 22	84	40
		23 to 26	83	40
		27 and more	43	20
	Education level	College degree	5	2
		Bachelor degree	77	37
		Master degree	122	57
		Doctorate	8	4
	Education field	Arts, Letters and Social Sciences	27	13
		Business, Management, marketing, communication	72	34
		Engineering Sciences and Technologies	75	36
		Health, Paramedical, Social, Life and sport sciences	21	10
		Law, Economics	15	7
	Other entrepreneurship education (EE)	No	94	45
		Yes	116	55
FEATURE OF	Abandonment of the project	No	190	90
		Yes	20	10
	Commercial motivation	No	123	59
		Yes	87	41
	Project phase	Ideation phase	12	6
		Feasibility research	56	26

		Research and development	79	38
		Commercialisation,Industrialization	63	30
	Size of teams	1	112	54
		2	46	22
		3	30	14
		4	11	5
		5 and more	11	5
	Years in entrepreneurial centre	>1	44	21
		≤1	166	79

65% of the respondents are male and the average age is 24. On the national level, 4294 students are enrolled in the PEPITE program in 2019. 65% of them are male and their average age is 24 (Gabay-Mariani, 2020, p.332)[1]. Based on these criteria, we can consider that our sample is representative of the national population of student entrepreneurs involved in the PEPITE program.

57% of the student of our sample have a master level and 37% are undergraduate. The main education fields are business and management (34%), and engineering sciences and technologies (36%). 90% of the students were still working on their project when they responded. 41% of them have a commercial motivation. 38% of students in the project were in the research and development phase and 30 % in the commercialisation or industrialization phase. Most of the students were only involved in their entrepreneurial project (54%). 79 % of them spent less than one year in the PEPITE centre when they responded.

3.4. PROCESSING OF DATA

We conducted a hierarchical classification to establish a taxonomy characterizing the diversity of situations about the features of the useful human capital, the contribution of EE to the building of this useful human capital and the influence of the profile of students and their projects. All variables are active and contribute to the shaping of classes. A hierarchical classification identifies classes characterized by modalities that are either over - or under - represented in this sub-group, compared to the distribution in the global sample. This kind of analysis is useful to highlight the determinants of homogeneity and heterogeneity within a population.

Table 5 shows the criteria of quality of the different classifications. The more we have classes, the more the criteria present good values: the intra-classes variance decreases, the inter-classes variance increases, the criteria of Calinski-Harabasz decreases and the indices of Davies-Bouldin decreases. However, the more important criteria to choose the number of classes is their relevance which is not captured by the indices. We selected the partition into 5

[1] The characteristics of the national population were construct using data from PEPITE France in 2019 (Gabay-Mariani, 2020, p. 332).

classes, because a higher number of classes leads to the apparition of very small classes with few significant variables. The partition in 5 classes leads to the definition of very significant active variables for each class, with test-values over 2 or beneath-2 (cf. *Table 7* to *Table 11*).

Table 5: Indicators of the quality of partitions

Criteria	3 classes	4 classes	5 classes	6 classes	7 classes	8 classes
Intra-classes variance	1,257	1,188	1,127	1,079	1,035	0,993
Inter-classes variance	0,175	0,245	0,306	0,353	0,397	0,439
Criteria of Calinski-Harabasz (pseudo-F)	14,427	14,142	13,903	13,364	12,991	12,768
Index of Davies-Bouldin	3,065	2,640	2,619	2,394	2,266	2,168

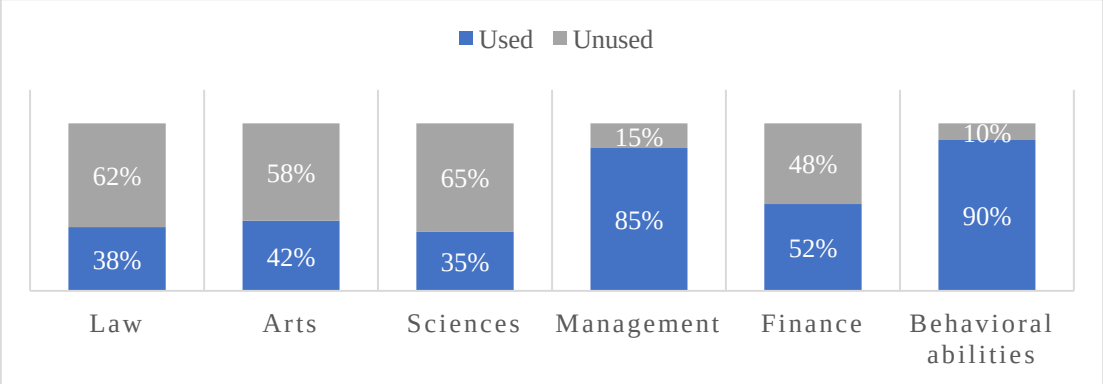
4. RESULTS

We present our results about the characterization of the useful GHK of student entrepreneurs and the contribution of education and experience to develop them, the perceived usefulness of EE that aim at developing SHK and a taxonomy of student entrepreneurs.

4.1. THE USEFULNESS OF GENERAL HUMAN CAPITAL (GHK) IN ENTREPRENEURIAL PROJECTS

Almost all students identify management skills and knowledge (85%) and behavioural abilities (90%) as useful elements of their GHK. The skills and knowledge developed in fields of knowledge such as law (38%), arts (42%), sciences (35%) and finance (52%) are used by a smaller proportion of students (cf. *Figure 1)*. They appear as more specific fields of knowledge, while management and behavioural abilities appear as transversal.

Figure 1: Usefulness of General Human Capital (GHK)

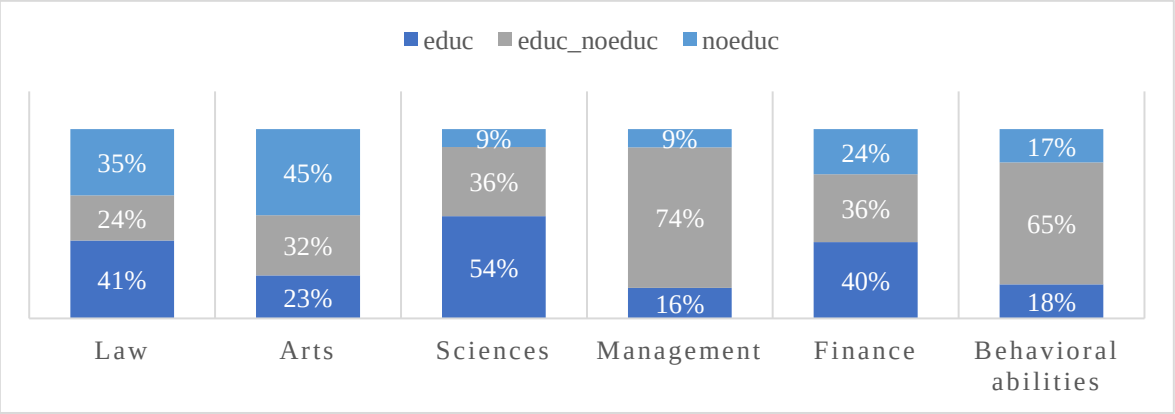


4.2. THE COMPLEMENTARITY OF GENERAL EDUCATION AND EXPERIENCE IN THE DEVELOPMENT OF USEFUL GHK

Figure 2 shows the complementarity between both vectors of GHK development: general education and personal life experience. Some disparities appear among the different fields of knowledge, skills, and behaviours. The role of general education appears particularly important to the development of the knowledge and skills used in entrepreneurial project namely sciences (54%), law (41%), and finance (40%). This can be explained by the importance of the

accumulation of codified knowledge transmitted by education and necessary to be able to benefit from life experience to develop these fields of knowledge. In the fields of management, general education and experience seem to be very complementary to the development of knowledge and skills (74%). It suggests a strong complementary between tacit and codified knowledge. The complementarity between general education and experience also appears very important for the development of the behavioural abilities, such as autonomy and critical thinking (65%). This clearly shows that the role of general education on the construction of GHK cannot be reduced to the transmission of tacit knowledge. Finally, the role of experience is very strong to the development of useful knowledge and skills in the field of art (45%) and to a smaller degree in the field of law (35%).

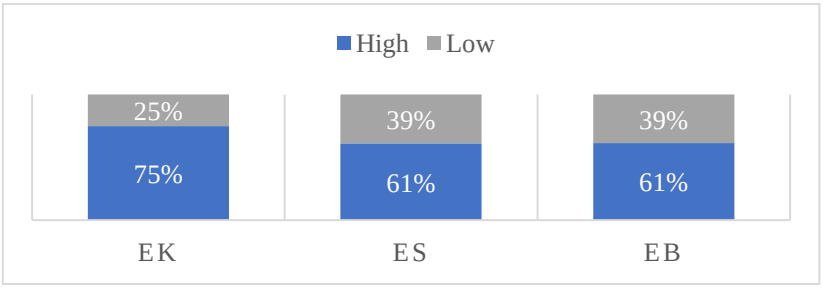
Figure 2: Complementarity of general education and experience in the development of the useful GHK of students



4.3. THE USEFULNESS OF ENTREPRENEURSHIP EDUCATION (EE)

Figure 3 shows the perceived utility of EE to the development of the Specific Human Capital (SHK). A large majority of students recognizes the usefulness of EE. They consider that EE contributes to the development of their Entrepreneurial Knowledge EK (75%), Entrepreneurial Skills ES (61%) and Entrepreneurial Behaviours EB (61%).

Figure 3: Development of SHK through EE



To appreciate the links between the features of useful GHK, the usefulness of EE, the profile of student entrepreneurs and the feature of entrepreneurial projects, we conducted a hierarchical classification.

4.4. TAXONOMY OF STUDENT ENTREPRENEURS

The best classification regarding the relevance of the classes separates the population in 5 classes. *Table 6* shows the size of each class.

Table 6: Size of classes

Classes	Effective *(N)*	Percentage *(%)*
Class 1	30	14,3
Class 2	43	20,5
Class 3	63	30,0
Class 4	48	22,9
Class 5	26	12,4
Sum	210	100

4.4.1. Users of management education

This class is characterized by an over representation of students having developed their behavioural abilities and their useful knowledge and skills in the fields of management, finance, and arts through general education (cf. *Table 7*). In other words, the part of their useful GHK in these fields is developed through general education more than in the average of the sample. Moreover, the development of useful GHK in sciences, finance, and management through both general education and experience is under-represented in this class. Student entrepreneurs have probably accumulated little experience. The perceived utility of EE to develop SHK is not over or under-represented in this class compared to the average of the sample. This class shows an over-representation of entrepreneurial projects being at the ideation phase. No specific features of students emerge from the analysis.

Table 7: Characteristics of class 1

Size of the class: 14,3% of the sample (N= 30)						
Variables	**Modalities**	**Modality in class *(%)***	**Modality in class *(effective)***	**Modality in sample *(%)***	**Modality in sample *(effective)***	**Test-value**
Management	educ	86,7	26	13,8	29	10,442
Behavioural abilities	educ	90,0	27	16,2	34	10,113
Finance	educ	56,7	17	21,0	44	4,538
Project phase	Ideation phase	20,0	6	5,7	12	2,793
Arts	educ	23,3	7	9,5	20	2,247
Sciences	educ_noeduc	0,0	0	12,9	27	-2,275
Arts	noeduc	3,3	1	19,0	40	-2,336
Finance	educ_noeduc	0,0	0	18,6	39	-3,025
Management	educ_noeduc	10,0	3	63,3	133	-6,381
Behavioural abilities	educ_noeduc	3,3	1	58,1	122	-6,714

4.4.2. Neither managers nor entrepreneurs

Students in class 2 use less than the average of the sample the knowledge and skills in the fields of management, finance, law, and their behavioural abilities in their project. Even if they have developed GHK through education or experience, it appears that they do not use it in their project. Moreover, there is an over-representation of the students that consider the usefulness of EE for developing entrepreneurial knowledge, skills, and behaviours (EK, ES, EB) to be low (cf. *Table 8*). Several features of the profile of students are over-represented: studying in the field of law and economics, being alone to develop their project and being involved for less than one year in the entrepreneurial centre. Moreover, students that have abandoned their project is over-represented. It seems that student entrepreneurs in class 2 didn't succeed in developing their entrepreneurial project or were not very involved in their entrepreneurial project.

Table 8: Characteristics of class 2

Size of the class: 20,5% of the sample (N=43)						
Variables	**Modalities**	**Modality in class *(%)***	**Modality in class *(effective)***	**Modality in sample *(%)***	**Modality in sample *(effective)***	**Test-value**
Management	Unused	60,5	26	14,8	31	8,292
Behavioural abilities	Unused	44,2	19	10,0	21	7,211
Finance	Unused	93,0	40	48,1	101	6,829
Size of team	1	83,7	36	53,3	112	4,468
EK	Low	53,5	23	25,2	53	4,369
EB	Low	65,1	28	38,6	81	3,794
ES	Low	65,1	28	39,0	82	3,718
Law	Unused	86,0	37	61,9	130	3,654
Years in entrepreneurial centre	≤1	97,7	42	79,0	166	3,581
Abandonment of the project	Yes	20,9	9	9,5	20	2,401
Other EE	No	60,5	26	44,8	94	2,147
Education field	Law, Economics	16,3	7	7,1	15	2,130
Other EE	Yes	39,5	17	55,2	116	-2,147
Law	educ	4,7	2	15,7	33	-2,148
Sciences	educ_noeduc	2,3	1	12,9	27	-2,263
Arts	educ_noeduc	2,3	1	13,3	28	-2,350
Abandonment of the project	No	79,1	34	90,5	190	-2,401
Finance	noeduc	0,0	0	12,4	26	-2,935
Finance	educ	4,7	2	21,0	44	-3,004
Finance	educ_noeduc	2,3	1	18,6	39	-3,220
Size of team	3	0,0	0	14,3	30	-3,254
Years in entrepreneurial centre	>1 to ≤5	2,3	1	21,0	44	-3,581
ES	High	34,9	15	61,0	128	-3,718
EB	High	34,9	15	61,4	129	-3,794
Behavioural abilities	educ_noeduc	30,2	13	58,1	122	-3,972
EK	High	46,5	20	74,8	157	-4,369
Management	educ_noeduc	30,2	13	63,3	133	-4,806

4.4.3. Entrepreneurial apprentices combining education and life experience

This class is characterized by students that have developed their knowledge and skills in management, law, arts, and their behaviour abilities through both general education and

experience (cf. *Table 9*). None of them have developed their useful knowledge and skills in management, only through general education. All of them consider their behavioural abilities as useful for their project. Students in this class perceive more than the average of the sample the usefulness of EE to develop SHK namely entrepreneurial skills and behaviours (ES and EB). In this class female, students in the fields of arts, letters, social sciences, undergraduate students, and entrepreneurial teams of two are over-represented.

Table 9 : Characteristics of class 3

Size of the class: 30% of the sample (N=63)						
Variables	**Modalities**	**Modality in class *(%)***	**Modality in class *(effective)***	**Modality in sample *(%)***	**Modality in sample *(effective)***	**Test-value**
Management	educ_noeduc	95,2	60	63,3	133	6,707
Behavioural abilities	educ_noeduc	85,7	54	58,1	122	5,382
Gender	Female	57,1	36	35,2	74	4,145
EB	High	82,5	52	61,4	129	4,093
Education level	Bachelor degree	55,6	35	36,7	77	3,530
ES	High	77,8	49	61,0	128	3,184
Education field	Arts, Letters and Social Sciences	23,8	15	12,9	27	2,779
Size of team	2	33,3	21	21,9	46	2,391
Law	educ	25,4	16	15,7	33	2,260
Arts	educ_noeduc	22,2	14	13,3	28	2,198
Size of team	4	0,0	0	5,2	11	-2,106
Arts	Unused	46,0	29	58,1	122	-2,161
Sciences	educ_noeduc	4,8	3	12,9	27	-2,183
Education field	Engineering Sciences and Technologies	23,8	15	35,7	75	-2,232
Finance	educ_noeduc	7,9	5	18,6	39	-2,518
Education level	Master degree	42,9	27	57,1	120	-2,580
Age	27 and more	7,9	5	20,5	43	-2,916
Law	educ_noeduc	0,0	0	9,0	19	-3,162
ES	Low	22,2	14	39,0	82	-3,184
Behavioural abilities	Unused	0,0	0	10,0	21	-3,389
Law	noeduc	1,6	1	13,3	28	-3,428
Behavioural abilities	educ	3,2	2	16,2	34	-3,459
Management	Unused	1,6	1	14,8	31	-3,732
EB	Low	17,5	11	38,6	81	-4,093
Gender	Male	42,9	27	64,8	136	-4,145
Management	educ	0,0	0	13,8	29	-4,212

4.4.4. Technological entrepreneurs

In this class students that have developed their knowledge and skills in finance, law, management, sciences, and their behaviour abilities through both general education and experience are over-represented (cf. *Table 10*). None of them have developed their useful GHK only through general education. Concerning the usefulness of EE, this class presents no specific feature compared to the average category of the sample.

Male aged from 23 to 26 years old, in master level in a technological or scientific field of education, having a commercial motivation and being in entrepreneurial teams of three members are over-represented. No student in this class has any education in the field of health. They are more involved than the average in the development of their SHK: they spent more time in the entrepreneurial centre and followed more other EE programs.

Table 10 : Characteristics of class 4

Size of the class: 22,9% of the sample (N=48)						
Variables	**Modalities**	**Modality in class *(%)***	**Modality in class *(effective)***	**Modality in sample *(%)***	**Modality in sample *(effective)***	**Test-value**
Finance	educ_noeduc	66,7	32	18,6	39	8,899
Law	educ_noeduc	33,3	16	9,0	19	5,793
Gender	Male	93,8	45	64,8	136	5,042
Management	educ_noeduc	89,6	43	63,3	133	4,398
Size of team	3	35,4	17	14,3	30	4,207
Education field	Engineering Sciences and Technologies	62,5	30	35,7	75	4,170
Education level	Master degree	83,3	40	57,1	120	4,164
Behavioural abilities	educ_noeduc	83,3	40	58,1	122	4,020
Sciences	educ_noeduc	29,2	14	12,9	27	3,364
Commercial motivation	Yes	58,3	28	41,4	87	2,527
Years in entrepreneurial centre	>1 to ≤5	35,4	17	21,0	44	2,515
Age	23 to 26	56,3	27	39,5	83	2,511
Other EE	Yes	70,8	34	55,2	116	2,334
Age	18 to 22	25,0	12	39,5	83	-2,211
Other EE	No	29,2	14	44,8	94	-2,334
Project phase	Feasibility research	12,5	6	26,7	56	-2,443
Years in entrepreneurial centre	≤1	64,6	31	79,0	166	-2,515
Commercial motivation	No	41,7	20	58,6	123	-2,527
Education field	Health, Paramedical, Social, Life and sport Sciences	0,0	0	10,0	21	-2,735
Law	Unused	43,8	21	61,9	130	-2,752
Management	educ	0,0	0	13,8	29	-3,446
Education level	Bachelor degree	14,6	7	36,7	77	-3,605
Size of team	1	29,2	14	53,3	112	-3,681
Behavioural abilities	educ	0,0	0	16,2	34	-3,848
Gender	Female	6,3	3	35,2	74	-5,042
Finance	Unused	14,6	7	48,1	101	-5,331

4.4.5. Mature student entrepreneurs

The over-representation of students that have developed through experience only, their knowledge and skills in the fields of law, finance, management, sciences, and their behavioural abilities, characterizes this class (cf. *Table 11*). All of them consider management knowledge and skills as useful for their projects. None of them have developed their useful knowledge and skills in management, finance, and their behavioural abilities through general education. As in

class 4, the perceived utility of EE to develop SHK is not over or under-represented compared to the average of the sample. This class is mainly characterized by students having a background in health science and with a doctorate level. They are older than students belonging to the other classes. Moreover, students that don't have a commercial motivation are over-represented in this class.

Table 11 : Characteristics of class 5

Size of the class: 12,4% of the sample (N=26)						
Variables	**Modalities**	**Modality in class *(%)***	**Modality in class *(effective)***	**Modality in sample *(%)***	**Modality in sample *(effective)***	**Test-value**
Law	noeduc	65,4	17	13,3	28	6,717
Finance	noeduc	61,5	16	12,4	26	6,484
Management	noeduc	46,2	12	8,1	17	5,777
Education level	Doctorate	30,8	8	3,8	8	5,499
Education field	Health, Paramedical, Social, Life and sport Sciences	46,2	12	10,0	21	5,140
Age	27 and more	57,7	15	20,5	43	4,333
Behavioural abilities	noeduc	46,2	12	15,7	33	3,809
Sciences	educ_noeduc	34,6	9	12,9	27	2,907
Sciences	noeduc	15,4	4	3,3	7	2,570
Commercial motivation	No	80,8	21	58,6	123	2,310
Age	18 to 22	19,2	5	39,5	83	-2,106
Management	educ	0,0	0	13,8	29	-2,145
Education field	Engineering Sciences and Technologies	15,4	4	35,7	75	-2,177
Management	Unused	0,0	0	14,8	31	-2,266
Commercial motivation	Yes	19,2	5	41,4	87	-2,310
Law	educ	0,0	0	15,7	33	-2,385
Behavioural abilities	educ	0,0	0	16,2	34	-2,442
Finance	Unused	23,1	6	48,1	101	-2,566
Education field	Business, Management, marketing, communication	7,7	2	34,3	72	-3,067
Law	Unused	30,8	8	61,9	130	-3,232
Sciences	Unused	26,9	7	64,8	136	-4,005

4.5. SUMMARY OF RESULTS

Based on the features of these 5 classes, we identify three main trends about the effect of EE on SHK and the contribution of general education and experience on the building of useful GHK (cf. *Table 12*). These trends are characterized by the vectors of development of GHK and SHK, the useful part of GHK, the student's profile and the features of their projects.

Table 12: Effect of EE on SHK and contribution of education and experience to useful GHK

Effect of EE on SHK	**Contribution of general education to useful GHK**	**Contribution of experience to useful GHK**	**Classes**	**Useful part of GHK**	**Specificities of the profile of Students**	**Specific features of Projects**
Low	Low	Low	Class 2		≤1 year in EE	Solo

					No other EE program Law, economics	entrepreneurs More abandonment
Average	High	High	Class 4	Finance Law Management Behavioural abilities Science	Male Science & tech. Master degree >1 year in EE Other EE progr. 23 to 26 years old	Teams of 3 members
		High	Class 5	Finance Law Management Behavioural abilities Science	Doctorate Health& life sc. > 27 years old No commercial motivation	
		Low	Class 1	Management Behavioural abilities Finance Arts		Ideation phase
High	High	High	Class 3	Management Behavioural abilities Arts	Female Undergraduate Arts, letters, social sciences	Teams of 2 members

The first trend is about a lower effect of EE on SHK and a lower contribution of both education and experience to build useful GHK. It is characterized by both profile of student and feature of project. It appears that these students developed probably a first entrepreneurial experience and don't perceive the effect of EE and the contribution of general education and experience.

The second trend is about a higher contribution of both education and experience on the development of useful GHK. Both vectors support the development of behavioural abilities, knowledge and skills used in entrepreneurial project in fields of management, finance, arts, and sciences (cf. T*able 12*). The effect of EE on the development of SHK is in the average of the sample. This trend is characterized by profile of student than feature of project. Students seem older students with higher levels of education than the average of the sample. It appears that the contribution of experience is more highlighted with a higher age and education level. Students with an early-stage project highlight the contribution of education to develop useful GHK. Those with a master's degree highlight the contribution of both education and experience and those with a doctorate level highlight mainly the contribution of experience.

The third trend is about a higher effect of EE and a higher contribution of both general education and experience. It appears that both education and experience contribute to develop useful behavioural abilities, knowledge, and skills in fields of arts and management. It is mainly represented by female studying arts and humanities with a bachelor's degree level.

5. DISCUSSION

We highlight several contributions to the literature about the human capital of entrepreneurs. We discuss the creation and transmission of human capital to student entrepreneurship, the diversity of situations on the construction and utilization of human capital according to contingency factors, and the criteria distinguishing general and specific human capital.

5.1. THE CREATION AND TRANSMISSION OF HUMAN CAPITAL TO STUDENT ENTREPRENEURSHIP

Our research contributes to the characterization of the aspects of human capital that are useful to student entrepreneurs. Rather than evaluating human capital in terms of education levels or education years (Estrin, et al., 2016; Unger et al., 2011; Davidsson and Honig, 2003), we characterize human capital in terms of useful skills, fields of knowledge and abilities. We distinguish GHK and SHK by the vectors of accumulation of their knowledge, skills, and abilities: education and experience for GHK and EE for SHK. This distinction allows us to characterize the respective contributions of general education, life personal experience and EE on the construction of student entrepreneurs' useful human capital.

By investigating the perceived usefulness of GHK and SHK to entrepreneurial student projects our research differs from previous ones focusing on the influence of human capital on entrepreneurial performance or entrepreneurial intention (Matricano, 2020; Wegner et al., 2019; Passaro et al., 2018; Estrin, et al., 2016; Unger et al., 2011; Davidsson and Honig, 2003). Our results show that management knowledge and skills, behavioural abilities are the most useful part of GHK to student entrepreneurs. While literature about human capital considers that codified knowledge is transmitted by general education and tacit knowledge by experience (Davidsson et Honig, 2003), we highlight the important contribution of general education to the transmission of useful know-how and behavioural abilities to student entrepreneurs. In our research we show that a large majority of students develop useful behaviour abilities through education or both education and experience. In the same way, it is reductive to associate experience to the development of tacit knowledge. We show that student entrepreneurs use in a complementary way both knowledge, know-how and behaviour abilities developed through experience. It is also the case for the entrepreneurial experience developed through EE. 75% of the students in our sample highlight the usefulness of EE to develop market and business model knowledge. This knowledge can be tacit because making a business model requires some skills, but also codified knowledge about facts, laws, market situations etc. (Verzat, 2015).

Moreover, our research emphasizes the important contribution of EE to the development of entrepreneurial competencies and knowledge. By developing experiential learning (Verzat,

2015; Verzat and Fayolle, 2013; Neck and Greene, 2011) and an entrepreneurial spirit (Brenet et al., 2017; Gasse, 2011; Léger-Jarniou 2008), EE contributes to develop entrepreneurial knowledge, know-how and behaviours.

5.2. DIVERSITY OF SITUATIONS ON THE CONSTRUCTION AND UTILIZATION OF HUMAN CAPITAL

Our study reveals diverse situations of construction and utilization of human capital in student entrepreneurial project. The traditional model of diffusion of academic knowledge through entrepreneurial activities mainly focuses on the role of academic researchers in spin-off creations in high-tech sectors, where the creation and transfer of scientific knowledge play a key role (Schaeffer, 2019; O'Shea, 2007; Wright et al., 2006). The study of the construction of the useful human capital of student entrepreneurs shows that universities, through their mission of education and their involvement in EE, contribute to the diffusion of a wide range of knowledge that is not limited to scientific and technological knowledge. More specifically, we show the importance of knowledge and know-how in artistic fields and their contribution to the development of the human capital useful to student entrepreneurs.

The identification of five classes of situations characterized by the vectors of development of the useful human capital, the features of students and entrepreneurial project, leads to discuss the influence of the education background on the perceived usefulness of GHK and SHK. It appears that older students with higher levels of education highlight the role of experience in the development of their useful GHK. The development of competencies and especially entrepreneurial competencies is an iterative process whit trial and error (Leyronas and Loup 2015; Verzat and Fayolle, 2013). By developing experience students develop competencies but also learn about their practice (Verzat and Fayolle, 2013; Neck and Greene, 2011) and thus better identify the usefulness of their human capital. Higher education by enhancing flexibility, openness, and independent thinking (Schwartz, 2006; Kohn et Schooler, 1983) can favour this process. Indeed, students in class 4 and 5, characterized by a higher level of education, highlight the role of experience, contrary to students in class 1 or 2. Students in class 4 and 5 have probably accumulated more experience that permit to develop GHK but also to develop a better reflexivity on their GHK developed through experience. However, they don't emphasize the role of EE on the development of SHK. Only one class is characterized by a higher perceived usefulness of EE. It is mainly represented by female studying arts and humanities with a bachelor's degree level.

Overall, the role of general education on the development of GHK is more highlighted in our classes than SHK through EE. Contrary to Unger et al. (2011) supporting the acquisition of entrepreneurial knowledge rather than past experiences, our results show that GHK developed through education and experience is important in entrepreneurial project too. In their project, student entrepreneurs combine various knowledge, know-how and abilities developed through different vectors. Each of them contributes to the construction of the useful human capital of students. This mobilization and construction of human capital is associated to the goal of EE program we studied, that is the development of entrepreneurial spirit beyond business creation (Verzat and Fayolle, 2013; Léger-Jarniou 2008; Gasse, 2011; Gibb, 1993).

5.3. MEASUREMENT OF HUMAN CAPITAL: GHK VS SHK

Each vector of construction of human capital can transfer similar knowledge, know-how and behavioural abilities to students. Our results show that critical thinking (Léger-Jarniou, 2008), autonomy, project management, communication, organization, and teamwork, generally associate to entrepreneurial competencies (Verzat, 2015; Loué and Baronet, 2015; Verzat and Fayolle, 2013), are also developed through general education and experience. Some entrepreneurial competencies developed through entrepreneurial experience (Gartner, 1988) are also developed through another context not directly related to entrepreneurship. Some part of SHK corresponds to GHK. Then, distinguish GHK and SHK through type of knowledge, skills, and abilities (Ucbasaran et al., 2008) doesn't seem relevant to construct exclusive criteria. In our research, we retain a definition of GHK and SHK based on the criteria of the vector through which it was developed. It permits to clarify the contribution of each vector of development of GHK and SHK whatever tacitness and type of knowledge.

Our research suggests some managerial recommendations to entrepreneurial organizations and universities. We highlight the high usefulness of EE for students engaged in entrepreneurship and having an educational background in arts, letters, and social sciences. Because these fields are highly involved in entrepreneurial activities, their students need to develop entrepreneurial knowledge, skills, and behaviours. We recommend universities to stimulate and develop entrepreneurial specific education and management education in the field of arts, letters, and social sciences. Moreover, our study reveals the important role of general education in the transmission of tacit knowledge, know-how and behaviours abilities in student entrepreneurship. To support these mechanisms, we recommend encouraging the development of practical training and internship in general education. In the continuity, it would be interesting to develop tools for students to reflect on their learning in general education. Such

tools developed in entrepreneurship education could also be applied to general education. Finally, young entrepreneurs at early stage of entrepreneurship constitute a challenge to EE. Higher education institutions should focus on this type of student entrepreneurs in the transmission SHK, either to encourage them to continue in entrepreneurship, or to encourage them to diffuse entrepreneurial spirit in beneficial activities to society other than business creation.

6. CONCLUSION

This research characterizes the contribution of general education, entrepreneurship education, and experience to the construction of knowledge, skills, and know-how useful to student entrepreneurs. The originality of this research is to identify the usefulness of student 'human capital in the development of their project. We distinguish general and specific human capital through their vector of development. This study reveals the different situations of construction and utilization of specific and general human capital in student entrepreneurial project. Indeed, we identify five classes of situations, characterized by the utilization of knowledge, the feature of students and entrepreneurial projects. This research highlights the specific role of the university in the creation and dissemination of behavioural abilities, not exclusively focused on explicit knowledge. In this way, general and entrepreneurial education but also experience contributes to the development of knowledge, know-how and behavioural abilities using in entrepreneurial project. This research gives some managerial recommendations to entrepreneurial organizations and universities to stimulate the development of useful human capital to student entrepreneurship.

Our research has some limitations that constitutes orientations for future researches. As the acquisition of SHK is not a linear process, the complementarity between GHK and SHK must evolve over time. Our research mainly focuses on student entrepreneurs at early stage of entrepreneurship. It would be interesting to pursue other studies on more advanced projects to understand the complementarity between general and specific human capitals over time. This study is focusing on the construction of useful human capital through the role of education and experience, however other mechanisms can support this construction. Social capital, which is also important during the start-up phases of the business creation, is complementary to human capital (Davidsson and Honig, 2003). Social capital supports human capital with a faster access to resources (Seet et al., 2018). It would be interesting to investigate the construction of both human and social capital at early stages of entrepreneurship.

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