

Review of the Interventions that Improve the Perceived utility of Learning by Students

Javier Sánchez-Rosas¹, *

<https://orcid.org/0000-0002-7669-8981>.

¹Universidad Nacional de Córdoba, Córdoba, Argentina.

Pablo Sebastián Correa², **

<https://orcid.org/0000-0001-7597-7180>

² Instituto de Investigaciones Psicológicas (IIPsi-CONICET-UNC), Córdoba, Argentina.

Iván Daniel Díaz¹, ***

<https://orcid.org/0000-0001-9254-7182>

¹Universidad Nacional de Córdoba, Córdoba, Argentina

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Abstract

Currently, educators face the challenge of making students consider useful what they teach in class. According to the expectation-value of motivation theory, the perceived usefulness is considered flexible in the face of external interventions. Even though a recent growing body of research has assessed the effectiveness of such interventions, there are no known publications that have reviewed the quantity, characteristics, concepts, correlates, and functioning of the examined interventions. To this end, the intention of this study was to describe the interventions that promote the usefulness perceived by the students. A non-systematic bibliographical review was carried out, producing ad hoc analysis criteria. Twelve interventions were identified, all based on the theoretical expectation-value model. The type, quantity and duration of the activities are diverse, consisting of asking students to make connections between the topics learned in class and their daily lives. Furthermore, the frequency of those connections is the mechanism through which interventions have an effect on learning. This review provides a variety of resources to the practice and research on education in order to produce changes in the perceived usefulness and improve the student's focus and performance.

Keywords: Academic achievement, learning, motivation, focus, educational psychology

Revisión de las intervenciones que mejoran la utilidad percibida del aprendizaje de los estudiantes

Resumen

Actualmente, los docentes se enfrentan al desafío de lograr que los estudiantes perciban como útiles los contenidos que enseñan en clase. Desde la teoría expectativa-valor de la motivación, la utilidad percibida es considerada flexible a las intervenciones externas. Aunque un cuerpo reciente y creciente de investigaciones han evaluado la efectividad de tales intervenciones, no se conocen publicaciones que hayan revisado la cantidad, características, conceptos, correlatos y funcionamiento de las intervenciones investigadas. Para tal fin, en este trabajo se buscó describir las intervenciones que promueven la utilidad percibida por los estudiantes. Se llevó a cabo una revisión bibliográfica no sistemática, construyéndose criterios de análisis *ad hoc*.

Se identificaron doce intervenciones, todas basadas en el modelo teórico de expectativa-valor. El tipo, cantidad y duración de las actividades es diverso y las mismas consisten en pedir a los estudiantes que hagan conexiones de los temas aprendidos en clase con su vida cotidiana. Asimismo, la frecuencia de dichas conexiones es el mecanismo a través del cual las intervenciones poseen efectos sobre el aprendizaje. Esta revisión aporta a la práctica e investigación en educación una diversidad de recursos para producir cambios en la utilidad percibida y mejorar el interés y el rendimiento de los estudiantes.

Palabras clave: rendimiento académico; aprendizaje; motivación; interés; psicología de la educación

Revisão das intervenções que melhoram a percepção da utilidade da aprendizagem dos estudantes

Resumo

Atualmente, os docentes enfrentam o desafio de fazer com que os estudantes percebam como úteis os conteúdos ensinados na sala de aula. Desde a teoria expectativa-valor da motivação, a utilidade percebida é considerada como flexível diante das intervenções externas. Embora um número crescente e recente de pesquisas tenha avaliado a efetividade de tais intervenções, não há ciência de publicações que tenham revisado a quantidade, características, conceitos, correlatos e funcionamento das intervenções pesquisadas. Este trabalho procurou descrever as intervenções que promovem a utilidade percebida pelos estudantes. Realizou-se uma revisão bibliográfica não sistemática, a partir da construção de critérios de análise *ad hoc*. Identificaram-se doze intervenções, todas elas baseadas no modelo teórico de expectativa-valor. O tipo, quantidade e duração das atividades diferem. Tais atividades consistem em pedir aos estudantes que façam conexões dos temas aprendidos na sala de aula com a sua vida cotidiana. Da mesma forma, a frequência de tais conexões é o mecanismo pelo qual as intervenções possuem efeitos sobre a aprendizagem. Esta revisão contribui para a prática e a pesquisa em educação com uma diversidade de recursos para produzir mudanças na percepção da utilidade dos conteúdos aprendidos e melhorar o interesse e rendimento dos estudantes.

Palavras-chave: rendimento acadêmico; aprendizagem; motivação; interesse; psicologia da educação

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Improving motivation and learning in academic settings is a goal shared by all teachers, institutions, and educational policies. Achieving this objective is relevant if we consider the results of the APRENDER tests (Educational Evaluation Secretariat, 2017) in Argentina, in which 18% of high school students are below the basic level in language, while in mathematics, the figure is 41%. At the same time, in its latest report, the Program for International Student Assessment (Organization for Economic Co-op-

eration and Development [OECD], 2015) indicated that in countries such as Brazil (44.1%), Mexico (33.8%), the United States (13.6%), and Spain (10.3%), students perform poorly in mathematics, language, and science. For middle-level students and for those starting higher education, one of the factors interfering with school motivation, learning, performance, dropping out, and grade repetition is the low usefulness of learning contents and activities as perceived by students (Anderman & Maehr, 1994; Hulleman & Harackiewicz,

2009; Lepper, Corpus, & Iyengar, 2005).

Perceived usefulness has been studied within the framework of one of the most prominent theories related to the study of motivation and learning: For example, the expectancy-value theory by Eccles et al. (1983) proposes that motivation in educational contexts is determined by expectations of success regarding an activity and by beliefs about the perceived importance of the activity. Among the value beliefs of the model, the concept of task value plays an important role as it is considered an important predictor of student performance and choices (Eccles et al., 1983; Simpkins, Davis-Kean, & Eccles, 2006; Wigfield & Cambria, 2010; Wigfield & Eccles, 2000; Xiang, Bruene, & Chen, 2005).

The value of the task is understood as the incentive to engage in academic activities (Eccles et al., 1983; Wigfield & Eccles, 2000) and it comprises four components: importance (relevance to one's identity), interest (inherent enjoyment of the task), cost (psychological barriers to and negative consequences of engaging in a task), and usefulness (useful for achieving short- and long-term goals). Importance and interest have an intrinsic character that, as a consequence, would make it more difficult to manipulate them extrinsically. According to Harackiewicz, Canning, Tibbetts, Priniski, & Hyde (2016), this would be the reason why researchers have addressed the usefulness component more frequently, as it offers more possibilities for being modified through interventions.

Utility-value interventions (UVI) are practical procedures that, through different modalities or applied to different people, have been implemented to improve students' perception about what they have learned in class. In general, these interventions consist of trying to make students find a relationship between a topic or learning material and their own lives (Hulleman & Harackiewicz, 2009). Some studies have shown that these interventions increase the interest and performance regarding different topics or subjects (Canning et al., 2018; Cook, Purdie-Vaughns, Garcia, & Cohen, 2012; Durik & Harackiewicz, 2007; Durik, Vida, & Eccles, 2006; Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Hulleman, Godes, Hendricks, & Harackiewicz, 2010;

Hulleman & Harackiewicz, 2009; Lazowski & Hulleman, 2016; Rosenzweig et al., 2018; Shechter, Durik, Miyamoto, & Harackiewicz, 2011; Shin et al., 2019; Walton, 2014).

Even though there is consensus regarding the influence of different motivational variables (Karadag, 2017) and instructional methods (Hattie, 2008, 2012) on the academic performance of students, no research reports describing interventions that sought to improve the usefulness perceived by students and/or that, ultimately, impinge upon learning and performance, were found. Such a review would allow university professors to benefit from an array of possible actions that could be implemented to improve the usefulness of the learning content and activities perceived by students. On this basis, the purpose of this paper is to describe the interventions that promote students' perceived usefulness (Hulleman & Harackiewicz, 2009). To this end, existing interventions were identified, and their procedures and activities were characterized. In addition, the effects of the interventions on the perceived usefulness itself and on other variables were described.

Before elaborating on the review carried out, some methodological aspects that guided and structured the review are described. In this work, a non-systematic bibliographic review of empirical research that assessed interventions aimed at improving students' perceived usefulness was conducted. Each research work was analyzed in a descriptive manner, without resorting to statistical procedures for analysis.

The search strategy for the bibliographic information consisted of the use of keywords in English (utility value, intervention, utility intervention, expectancy-value) and in Spanish (*valor de utilidad, intervención, intervención de utilidad, expectativa-valor*). Their selection was based on the interest in exploring the interventions that rely on the theoretical model of expectancy-value. Likewise, the acronym STEM (Science, Technology, Engineering, and Mathematics) was used since it was possible to anticipate the existence of several interventions that have improved the perception of usefulness of subjects or careers in natural sciences, technology, engineering and mathematics.

The search was done on the Dialnet and Science Direct databases and on the Virtual Library of the Ministry of Science and Technology of Argentina, which includes databases such as Ebscohost, Scopus, or Scientific Electronic Library Online (SciELO). We applied filters that specifically provided research articles in English and Spanish related to the area of educational psychology, which had full texts. In addition, a manual search of the reference list of each article found was carried out to identify papers that would not have been detected through the database search. The search was made in December 2017. The strategy used made it possible to find a total of 64 documents.

Only the empirical articles whose aim, or one of their aims, was to design and evaluate interventions to modify the perceived usefulness, and that were based on the theoretical model of expectancy-value, were chosen. Efforts were made to exclude publications such as conference papers, book chapters and those lacking peer review in order to consider only articles published in journals that allow access to methodological information on the interventions in more detail. At the same time, presentations made in conferences were discarded because their content usually precedes that of a subsequent publication, which would result in having duplicate documents in the analysis. The application of these criteria resulted in a total of twelve empirical articles that make up the material to be described insofar as they are considered relevant to the objectives of this work.

In order to meet the objectives previously set, the authors' names and the year of publication of each article were identified from the information collected. Next, the procedures and instructions used in each intervention were described. Subsequently, the activities that comprised each implemented procedure were described, for which five categories were created to organize the information: type, quantity, characteristics, duration and frequency of each activity. Finally, the variables that preceded or were simultaneous to the manipulation of the usefulness and effects (direction and magnitude) of the interventions on consequential variables were obtained from the sources of information.

It should be noted that the information obtained was organized taking into consideration the educational level of the samples in each study. Specifically, first, the data and analysis of the studies that used samples of high school students are presented. Secondly, the information obtained from studies that have used university samples is explained. The organization of data and the analysis undertaken were carried out simultaneously and together with the authors of this article.

Description of the Procedures Followed in the Interventions on Perceived Usefulness

The researchers who have designed these interventions often report in the methodological section, with a certain degree of precision, the implemented procedures, that the interested reader can consult in each publication. The following is a brief description of the different procedures followed in the interventions aimed at modifying the usefulness perceived by students. The description includes the interventions designed to improve the perceived usefulness but that do not report on their effects on usefulness itself, as well as those that have indeed reported on their effects on the perceived usefulness and other resulting variables. Table I contains a summary of the collected information.

In samples with high school students, some interventions consist of asking a group of students to write an essay on how to link or apply what they have learned in class to their own lives or the life of a person they know (Durik et al., 2014; Hulleman & Harackiewicz, 2009). Other studies have resorted to the inclusion of the participants' parents, specifically through brochures, informative websites and telephone interviews, providing them with tips and tools to comment on and to show their children the usefulness of learning about subjects such as mathematics or natural sciences, both for their daily lives and for their professional future (Harackiewicz et al., 2012; Hyde et al., 2016; Rozek et al., 2015, 2017).

Among the research works that have used university students as participants in their samples, one of the ways in which several studies have developed interventions in order to improve

the perceived usefulness is to ask a group of students to write an essay, a summary or a letter on how to connect or apply topics learned in class to their own lives or to the life of a person close to them (Harackiewicz et al., 2016; Hulleman et al., 2017). Another possible alternative is to ask students to search websites for information on the subjects they learn and to write, also as a letter or an essay, why what they learn in class is useful or important (Hulleman et al., 2010).

In addition, some studies have used exercises so that the topics learned in class can be perceived to be useful for a future career. These in-

terventions have resorted to the use of computer videos or examples about the short- and long-term usefulness of the topics developed in the classroom (Shechter et al., 2011), or have used fictional stories in which a student connects what he or she has learned in class to his or her future aspirations, and students are later asked to try to visualize the study material the way the character in the story does (Lee Johnson & Sinatra, 2012). Interventions in which the teacher tries to demonstrate the value of a particular theme to solve socially relevant problems have also been implemented (Brown et al., 2015).

Table 1
Description of Interventions on Perceived Usefulness

| Authors | Sample (Educational level) | Activity | Extension | Duration |
|---|--|---|--|--------------------|
| Hulleman & Harackiewicz (2009); Hulleman et al. (2017) | College students | Essays (8), concept maps, brochures | At least five sentences | 2nd semester |
| Hulleman et al., (2010) | College students | Summary (1), letters (1) | At least three paragraphs | 15 weeks |
| Shechter et al., (2011) | College students | Audiovisual | n/a | n/a |
| Lee & Sinatra (2012) | College students | Reading of a fictional story | At least one story | At least one hour |
| Harackiewicz et al. (2012); Hyde et al. (2016); Rozek et al. (2015, 2017) | Mothers, fathers, and high school students | Paper (1) and electronic (1) brochures, web-based electronic questionnaires (1), telephone interviews | n/a | n/a |
| Durik et al. (2014) | High school students | Essays (1) | n/a | 6 weeks |
| Brown et al. (2015) | College students | Academic articles, surveys | One paragraph (Study 1 and 2), four paragraphs (Study 3) | At least one class |
| Harackiewicz et al. (2016) | College students | Essays (1) | At least one page | 4 semesters |

Note. n/a: no data, the article did not provide the necessary information.

Interventions on Perceived Usefulness and its Effects

While there are interventions aimed at modifying the usefulness perceived by students (e.g., Hulleman & Harackiewicz, 2009; Lee Johnson & Sinatra, 2012; Shechter et al., 2011), some of them do not report the effects of the interventions on perception (Hyde et al., 2016; Lee Johnson & Sinatra, 2012; Rozek, Svoboda, Harackiewicz, Hulleman, & Hyde, 2017; Shechter et al., 2011). This is the reason why the effects of the interventions on perceived usefulness cannot be singled out. Conversely, there are other interventions (Brown, Smith, Thoman, Allen, & Muragishi, 2015; Durik, Schmidt, Shumow, & Rodenbeck, 2014; Harackiewicz, Rozek, Hulleman, & Hyde, 2012; Harackiewicz et al., 2016; Hulleman et al., 2010; Hulleman & Harackiewicz, 2009; Hulleman, Kosovich, Barron, & Daniel, 2017; Rozek, Hyde, Svoboda, Hulleman, & Harackiewicz, 2015) that did report in a disaggregated way on the effects of their interventions on perceived usefulness and on the way the perceived usefulness afterwards produced modifications in other variables.

Table 2 shows the interventions on perceived usefulness and their effects on other consequential variables. As can be seen in the table, interventions have controlled the moderating role of motivation and the previous performance of students or the educational level of their parents. In general, the interventions had moderate effects and improved the perception of usefulness, the interest and the performance related to subject content and careers in natural sciences, technology, engineering and mathematics.

In samples with high school students, a research assessed whether classroom activities that encouraged ninth- and tenth-grade students to connect learning materials to their lives could increase their motivation and learning. The intervention succeeded in getting those with low expectations of success more interested in science at the end of the semester. However, those who already had high expectations of success revealed no change in their interest in science (Hulleman & Harackiewicz, 2009).

In connection with the studies carried out with samples of university students, effects of the usefulness on variables such as interest, performance

and motivation have been found. Specifically, there is evidence to suggest that an intervention in which the relevance of an activity to students' lives is manipulated impinges on interest, performance, and perceived usefulness, especially in the case of students that have low performance expectations (Harackiewicz et al., 2016; Hulleman et al., 2010). Furthermore, some studies have found that manipulating the frequency with which students make connections between study material and their lives affects the students' interest in learning (Hulleman et al. 2017). In addition, some authors have found that following an intervention that stresses the community utility value of certain knowledge in particular, students report higher levels of motivation towards acquiring that knowledge (Brown et al., 2015).

Making Connections: The Mechanism of Interventions in Perceived Usefulness

Overall, studies have shown that interventions designed to increase perceived usefulness subsequently increased interest and performance, and that these effects are particularly true for the most vulnerable students (for reviews see Durik, Hulleman, & Harackiewicz, 2015; Harackiewicz, Tibbetts, Canning, & Hyde, 2014; Hulleman et al., 2017). A common aspect of interventions is the relationship or connection that students make between a topic and their own lives; it is important to try to understand the reason why making such connections improves perceived usefulness. It should be clarified that even though, when describing their interventions, Hulleman et al. (2010), Hulleman & Harackiewicz (2009), and Harackiewicz et al. (2016) have used interchangeably the terms relevance and utility value, there is an important distinction to be made. While utility value refers to the usefulness for a proximal or distal goal, relevance refers to the presence of a relationship between a topic or idea and another topic or idea, which may include a goal, but also a broader set of relationships. For example, math might be useful because it will help me in a future job (utility value), or it might relate to my life because store cashiers need it even if I don't use it (relevance). Because the utility value intervention is a type of relevance intervention, one possible mechanism related to the utility value interven-

tion is that encouraging students to find a connection allows them to find relationships they did not previously have in mind. Making such connections can allow individuals to see new information from a different perspective and develop a deeper integration of their knowledge (Bransford & Schwartz, 1999). On the other hand, making a connection can improve learning by generating a

set of processes that create a different approach capable of increasing learning. For example, if a student finds a personal connection during a psychology conference, they may be more interested in the assigned reading and discuss the material with friends. In general, students may be more motivated to actively process the material during the lecture and later when reading the book.

Table 2
Interventions on Perceived Usefulness and Effects on Other Variables

| Authors | Covariates | Dependent variables |
|--------------------------------|--|--|
| Hulleman & Harackiewicz (2009) | Expectations of success, interest in science | Interest in science ($\beta d = -.11$), Performance ($\beta d = -.18$), Interest in Science courses ($\beta d = .58^1$) |
| Hulleman et al. (2010) | Interest, performance expectations | Situational interest ($\beta d1 = .66$, $\beta d2 = .61$), Sustained interest ($\beta d1 = .60$, $\beta d2 = .31$), Qualifications ($\beta d2 = .33^2$) |
| Harackiewicz et al. (2012) | Parents' educational level | Taking STEM courses ($\beta d = .18$) |
| Durik et al. (2014) | Initial interest in science, expectations of success, performance in science, initial perceived utility, achievement goals | Interest in science ($\beta d = .14$) |
| Brown et al. (2015) | | Positivity towards research ($\beta d1 = .62$, $\beta i2 = .64$, $\beta i3 = .61$), Motivation towards future careers ($\beta d1 = .33$, $\beta i2 = .34$, $\beta i3 = .44$), Importance of research ($\beta d2 = .60$, $\beta d3 = .26$) |
| Rozek et al. (2015) | Parents' educational level | Future assessment of STEM careers ($\beta d = .29$, $\beta i = .37^3$) |
| Harackiewicz et al. (2016) | Confidence in performance, grade point average | Performance ($\beta d = .08$), commitment to study material ($\beta d = .11$) |
| Hulleman et al. (2017) | | Interest ($\beta d2 = .37^4$) |

Nota. ¹ Negative covariance between the effects of the intervention and success expectations initially reported by the student; ²The distinctions in the effects on the variables (1, 2, 3) refer to each study reported in the article; ³ Indirect effect mediated by the perception students had of their parents' appreciation of STEM careers; ⁴ The distinction in the effects on the interest variable (1, 2) refers to each study reported in the article

Establishing relationships between new knowledge and old ideas can create a richer cognitive architecture that students can use when studying. As a result, students who make more connections between course material and existing knowledge are more likely to find the course useful, which can improve motivation. Indeed, Hulleman et al. (2017) tested and positively demonstrated the hypothesis that the frequency of connections is an important mechanism through which utility value intervention produces its effects. In their studies, students who reported making more frequent connections between course material and their lives reported more interest in the material at the end of the semester. Furthermore, this link between connection frequency and results was explained by a concomitant increase in utility value perceptions. Thus, the frequency of connections is an important aspect of finding value and developing interest in academic content. Specifically, making frequent connections between the material and the lives of students increases utility value and learning outcomes.

Conclusions

The activity of teachers and, particularly, of university professors, faces new and persistent challenges, such as the massification of classrooms, high failure and dropout rates, training in skills for the future, among others (Echeverría Samanes, & Martínez Clares, 2018; González-Arias & Martínez-Molina, 2016). Numerous strategic, motivational, and affective factors pertaining to students have been identified as causes or determinants in learning processes and their outcomes (Curione, Gründler, Píriz, & Huertas, 2017; Domínguez-Lara, Calderón-De la Cruz, Alarcón-Parco, & Navarro-Loli, 2017; Domínguez-Lara & Merino-Soto, 2018; Sánchez-Rosas, Aguirre, Bovina-Martijena, & Galarza, 2019). Even when these factors are linked to student experience, educators try to determine the extent to which they can implement practices that mitigate the effects of these factors on learning outcomes.

As discussed in this article, different research

works have made progress in identifying actions that can be applied to improve students' perceived usefulness of learning (Hulleman & Harackiewicz, 2009). A review of the activities implemented in each intervention shows that, depending on the availability of time and technical resources, they are generally simple and feasible. The instructions that accompany the activities are varied, but they point to a common goal: Students must establish meaningful relationships between learning topics and their lives (Hulleman et al., 2017). Specifically, interventions consist of asking students to establish a connection between the topics learned in class and their daily lives, to look for information on websites about the topics covered in class, or of having teachers and parents use examples to demonstrate the usefulness of the content in order to pursue a future university career. The establishment of associations between learning and daily life and the frequency of those associations could be the mechanism through which interventions positively impact perceived usefulness. Taking into account the feasibility of manipulating perceived usefulness (Harackiewicz et al., 2016) and the simplicity of the resources required (Durik et al., 2014; Harackiewicz et al., 2016; Hulleman et al., 2017; Hulleman & Harackiewicz, 2009) to implement the interventions, it is considered that they should be incorporated into the teaching practice.

The reviewed interventions are characterized by targeting high school and university students, and their results have a more positive impact on the students that have lower levels of motivation and lower performance. In addition, some interventions have improved students' perception of the usefulness of the content in subjects related to natural sciences, mathematics and engineering (Brown et al., 2015; Durik et al., 2014; Harackiewicz et al., 2012; Hulleman & Harackiewicz, 2009; Rozek et al., 2015). In view of the above, it is considered that this body of research provides empirical evidence that could be useful in decision-making for those who design educational policies. This way, those who manage educational institutions would achieve a threefold goal: to innovate, motivate, and commit.

In spite of the advantages shown in the re-

viewed evidence, it should be noted that the analyzed research has limitations. There is a consensus that adolescents are generally less motivated (Rosenzweig & Wigfield, 2016), reason why they would benefit from actions to mitigate this problem. While the reviewed studies would seem to indicate that through interventions it would be possible to create a motivated transition of high school students to university careers in natural sciences and technology, it would be necessary to assess whether they would be equally effective for other areas of knowledge. Another limitation to consider is that, even though some procedures included the participation of families to modify the perceived usefulness through dialogues between high school students and their parents, these strategies were not validated for the university level, so it would be relevant to conduct a research on the scope of this type of interventions in university populations.

On the other hand, even though the research addressed the problem of motivation in students at the undergraduate level, it is worth mentioning that, along with the expansion of postgraduate studies in recent years, such motivational problems also extended to this level of training (Bair & Haworth, 2004). Therefore, researchers could test the effectiveness of their interventions by analyzing their ability to influence the decision to pursue, persist or abandon postgraduate studies. Finally, it is important to note that only the interest, performance and career choice variables have been systematically analyzed in the studies. Different authors have determined that variables such as attention or participation in class play a relevant role in the learning process (e.g., Molinari & Sánchez-Rosas, 2018; Sánchez-Rosas, & Esquivel, 2016), so it is considered relevant to include other variables and explore the effects that interventions in utility value have on them.

In summary, although it is necessary to continue exploring whether these results can be generalized in other educational contexts (Rosenzweig, Hulleman, Barron, Kosovich, Priniski, & Wigfield, 2019), implementing interventions such as those reviewed in this study could improve the classroom experience by providing positive feedback on the teaching-learning dynamics.

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