# How to improve knowledge transfer strategies and practices in education? Answers from a systematic literature review.

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**Abstract**

Building on the systematic review methodology, this paper aims to examine the knowledge transfer process in education and its main determinants in this specific context. Our findings suggest that linkage agents are central actors in the knowledge transfer process. Their intervention is critical to help adapt the knowledge produced by researchers and make it easier to adopt and use by practitioners. Moreover, the effectiveness of this process hinges on several factors that were broken down into three major categories: determinants related to transferred-knowledge attributes, those related to the actors involved in the process, and determinants related to transfer mechanisms.

Keywords: Knowledge transfer, Education, Linkage agents, Systematic review, Determinants

**Introduction**

Knowledge transfer is a major concern in improving educational practices (Huberman 1990; Love 1985; Willmott 1994). Actually, even if new information and communication technologies have made it much easier for practitioners to access research results, there is still a large gap between the knowledge produced by research providers and the one used in practice. Anderson (1992) attributes the reasons for this gap mainly to researchers who often allow much more interest, time, and effort to the production of new knowledge than to the dissemination of their research results. This then turns into a major barrier to the diffusion of research results to managers, policy-makers and practitioners. For other authors, the reasons of this gap are attributed to practitioners. Hence, the resistance of practitioners to adopt new knowledge (Kirst 2000) and their often limited competencies and skills (Hemsley-Brown and Oplatka 2005) are some of the main handicaps for the appropriation and application of research results. Whether the weakness is on the research side or the practice one, it's largely admitted that knowledge transfer between researchers and practitioners should be further encouraged and promoted since it represents the only viable way to significantly reduce the gap between knowledge creation and knowledge use.

Drawing on the systematic review methodology, this paper aims to advance knowledge on knowledge transfer in education by investigating the typical process and the main determinants of the phenomenon in this particular context. The research findings should provide a better understanding of the knowledge transfer process in education, and enable evidence-based recommendations for researchers as well as for managers and policy-makers in order to improve knowledge transfer activities.

**Theoretical Background**

Several models of knowledge transfer and utilization have been proposed in the literature on education. Havelock's models (Havelock 1973) are probably the ones that laid foundations to the current theoretical developments in this field. These models have become broadly known with the works of Huberman (1983; 1990; 2002) and Huberman and Gather-thurler (1991). Several other models have been developed after Havelock's frameworks. According to Neville and Warren (1986), these models break down into four main groups: 1) the RDD (research, development, diffusion) models, 2) the problem-solving models, 3) the linkage models, and 4) the social interaction models.

RDD models focus on the advancement of knowledge as the most critical factor for research utilization (Hargreaves 1999; Havelock 1973; Neville and Warren 1986; Love 1985). They subscribe to a science push approach where the knowledge producer, mainly university researchers, is the central actor in the knowledge production and diffusion process. Within the problem-solving models' general framework, users are the principal initiators of change, since they are responsible for needs' identification and formulation (Havelock 1973; Neville and Warren 1986; Love 1985). The researcher is regarded as a "technician" that is solicited to respond to the users' needs (Love 1985). According to Havelock, as cited by Love (1985), there are five steps in a typical problem-solving model of knowledge transfer: 1) needs identification, 2) articulation of the problem, 3) search for solutions, 4) selection of the best solution, and 5) implementation of the retained solution to satisfy the need.

The linkage models integrate the concepts and premises of the two aforesaid ones. They emphasize the implementation of mechanisms to ensure formal linkages between knowledge producers and potential users (Huberman 2002; Neville and Warren 1986; Love 1985). Finally, the social interaction models emphasize knowledge diffusion between persons and systems (Cros 1997; Hargreaves 1999). According to this perspective, knowledge utilization is a result of repeated interactions between researchers and users (Havelock 1973; Huberman 2002). Users are then considered as co-producers of knowledge alongside with researchers (Hargreaves 1999).

As stated earlier, the objective of this paper is to investigate the knowledge transfer process and its determinants in the educational field. The exploration of these important issues requires a consideration of the four groups of models stated above. Hence, while answering our main question, one of the objectives of this study will be to assess the effectiveness of the theoretical frameworks so far proposed to support knowledge transfer in education, and eventually propose one that fits with the current needs and specificities of the education sector.

**Methods**

This paper uses a systematic review approach in order to investigate the knowledge transfer process and its determinants in education. A systematic review is a literature review following a rigorous, transparent and reproducible process, which aims to identify, select, appraise, analyze and synthesize, in a systematic and comprehensive way, research evidence on a specific research topic (Cook et al. 1997; Transfield et al. 2003; Moynihan 2004). Systematic reviews are nowadays widely considered as the least biased and the most rational way to synthesize research evidence, and a powerful tool to provide the best available knowledge for decision making (Fox 2005; Moynihan 2004). The basic steps for a systematic review include: 1) formulating an explicit research question, 2) fixing inclusion and exclusion criteria, 3) finding relevant studies, 4) selecting the studies according to the inclusion and exclusion criteria, 5) assessing the quality of retained studies, 6) summarising and synthesising study results, and 7) interpreting the review results (Alderson et al. 2004; Moynihan 2004; Transfield et al. 2003).

This systematic review on knowledge transfer in education sets out to answer the two following research questions: 1) what are the main stages making up a typical knowledge transfer process in education? 2) what are the main determinants of knowledge transfer in education? To be included in the review, a study should deal with knowledge transfer in education, and treat conceptually and/or operationally at least one of the two research issues (i.e., stages and/or determinants of knowledge transfer process). Peer-reviewed papers published between 1980 and 2006, as well as research reports were considered. Books, dissertations and book reviews were excluded, due to time and resource limitations. It is assumed, however, that relevant ideas and significant scientific contributions included in books and dissertations are often published afterwards in peer-reviewed articles.

A three-stage strategy was used to locate relevant studies for the review. A systematic computerized search was conducted within three multidisciplinary and two specialized databases. The electronic search strategy is detailed in the appendix. In addition to the electronic search, a manual search was conducted within all the volumes published between 1980 and 2006 of the following journals: Educational Administration Quarterly, Studies in Educational Evaluation, Teaching and Teacher Education and Oxford Education Review. The manual search also covered some references cited in some electronically identified documents. The third and last stage of our search strategy is the contact of some experts identified within our research

network and on the websites of some research centers specialized in education. All the identified documents were treated using the EndNote software in order to identify and eliminate duplicate studies.

All in all, 8981 documents were identified and reviewed by the research team members according to the inclusion and exclusion criteria. A first sorting based on the documents' titles and abstracts led us to exclude 8248 documents that did not meet at least one of the inclusion/exclusion criteria. The thorough reading of the full text of the remaining 773 documents concluded to the exclusion of 677 citations. Hence, 56 documents crossed the double sorting. Each one of these documents was subjected to a meticulous assessment of its methodological quality by all the members of the research team. This step led us to exclude 6 documents. Thus, 50 documents were definitely included in the systematic review (Figure 1).
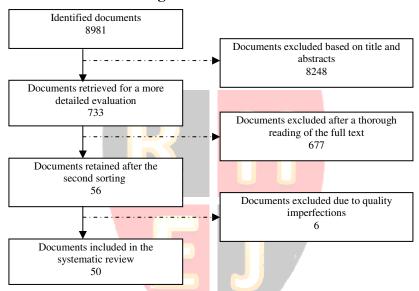
**Figure 1. Systematic Review Flow Diagram**



The publications' trend of the included documents (Figure 2) clearly shows that the number of works on knowledge transfer in education increased remarkably since the beginning of the nineties. Most of the studies included in the systematic review are scientific peer-reviewed articles (88.0%) while 12.0% are research reports (Figure 3). Moreover, the distribution of the included studies by type of research (Figure 4) shows that 44.0% of them cover qualitative work, 42.0% are conceptual essays, and only 14.0% include an empirical quantitative validation.
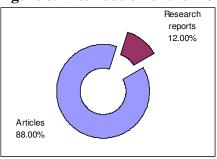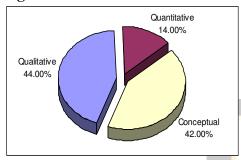
**Figure 2. Publications' trend**

**Figure 3. Distribution of the included studies by type of document**

Research
reports
12.00%

Articles
88.00%

**Figure 4. Distribution of the included studies by type of research**

Quantitative
14.00%

Qualitative
44.00%

Conceptual
42.00%

**The Knowledge Transfer Process in Education**

The knowledge transfer process in education aims to increase the use of research results by potential users (Havelock 1973; Huberman 1983) in order to improve practices, to implement new programs, and to resolve specific problems. As explained earlier, four theoretical frameworks led the study of this concept in the education literature: the RDD models, the problem-solving models, the linkage models, and the social interaction models.

The examination of the included studies shows that the three first models have received serious criticisms from the scientific community of researchers on education. In addition to paying all the attention to the university-created knowledge, the RDD models have been criticised to support a logic of absence of knowledge exchange and interaction between actors belonging to different disciplines and different fields of expertise (Hargreaves 1999). This linear approach to knowledge creation and diffusion process, stresses much more the knowledge production phase and practically ignores the users' context (Neville and Warren 1986).

The problem-solving models received, in their turn, two major criticisms. First, these models are only interested in users' needs-driven knowledge. Then, these models ignore the large amount of knowledge produced for other purposes than answering users' needs. Second, these models pay little attention to transfer mechanisms that should be implemented to facilitate the communication between researchers and users. This could result in a significant barrier to knowledge transfer and utilization of research results, especially when the interests and needs of users are not concomitant to the issues investigated by researchers. As for the linkage models, the major criticism they received relates to the specificity and the exclusivity of the mechanisms they suggest to bring together researchers and users. According to Huberman (1983), these
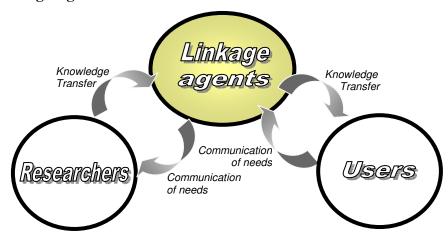
models oversimplify the knowledge transfer process by mobilizing a narrow perspective regarding the mechanisms that could be mobilized, especially in the education field (Huberman 1983; Neville and Warren 1986).

These criticisms addressed to the first three models, place the social interaction one in a favourite position to underlay research on knowledge transfer in education since it overcomes many of the drawbacks of the first ones. Actually, the social interaction framework offers a dynamic perspective to study knowledge transfer. It then puts an equivalent emphasis on both researchers and knowledge users. It also stresses the importance and the critical role of linkage mechanisms to ensure an efficient knowledge transfer between the two communities. In fact, the social interaction model underlines a large set of linkage mechanisms that can develop an effective area of reciprocal interest between the two sides. These mechanisms should not only be adapted to the characteristics of the actors involved in the process, but should also be varied in order to ensure the transfer of different types of knowledge. These mechanisms vary from written documents, to electronic tools, to even the settlement of intermediary agents between research and practice milieus to make sure the knowledge transfer is occurring in an efficient and effective way.

Beyond the arguments stated for and against the different models underlying research on knowledge transfer in education, the examination of the included studies shows that a large number of works on education investigated the knowledge transfer process between two systems of actors (i.e. researchers and users). Whether using the RDD, the problem-solving, the linkage, or the social interaction model, most of these studies have considered the direct knowledge transfer between researchers and users. Only few exceptions investigated the role that can be played by linkage agents to enhance and improve the knowledge transfer process between these two communities. However, as argued by Havelock (1973), Huberman (1983; 1990), and Huberman and Gather-Thurler (1991), the actors working in the interface between the two communities play a critical role in the knowledge transfer processes. These actors could be specialists interested in university research, pedagogy counsellors working in a school system, or professional managers involved in knowledge transfer activities (Huberman and Gather-Thurler 1991).

Moreover, a framework considering the linkage agents as intermediary actors between researchers and users seems to be more suited to the education field (Figure 5). The latter is a domain of practices requiring an active participation of linkage agents to translate research results into easy to implement and use practices. By favouring the communication of needs between both communities and by facilitating the dissemination and appropriation of knowledge by practitioners, linkage agents could substantially contribute to improve the knowledge transfer process in education.
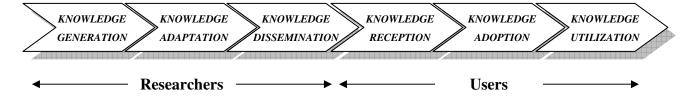
**Figure 5. The Linkage Agents' Framework**



However, in order to investigate the linkage agents' framework of knowledge transfer in education as well as its determinants, an adaptation effort is necessary in order to integrate the research results of the studies considering only two systems of actors. The authors begin by integrating the research results on the dyadic knowledge transfer process (i.e., between two systems of actors) before adapting the results to the triadic knowledge transfer process (i.e., researchers-linkage agents-users).

**The knowledge transfer processes between two systems of actors (researchers-users)**

The steps making up a dyadic knowledge transfer process varies according to the authors. An integration of the models proposed in the literature leads us to propose a six-step process, going from the generation of knowledge by researchers to its utilization by users (Barnard et al. 2001; Hemsley-Brown 2004; Kirst 2000; Love 1985). These steps include: 1) knowledge generation, 2) knowledge adaptation, 3) knowledge dissemination, 4) knowledge reception, 5) knowledge adoption, and 6) knowledge utilization (Figure 6). The three first steps are commonly attributed to researchers, whereas the other three steps concern the users.

**Figure 6. Main steps of a dyadic knowledge transfer process**



Knowledge generation consists in the creation of knowledge by knowledge producers (Hemsley-Brown and Sharp 2003; Love 1985). In education, knowledge could be generated from various sources including university research communities, professional associations, ministries and government agencies, transfer and innovation centers, and communities of practice. Knowledge adaptation concerns research results and aims to make them accessible to and easily

understandable by potential users. This step is crucial for the success of the knowledge transfer process, since it will have an influence on the decision of the user to adopt or not the knowledge generated by researchers. Indeed, the availability of research results does not necessarily guarantee their adoption and utilization by potential users. Several authors have found that the format in which the research results are presented could be an incentive or a barrier to the adoption of knowledge in the education community (Hemsley-Brown 2004; Kirst 2000; Love 1985).

Knowledge dissemination is associated with the transfer of research results to communities of practice (Neville and Warren 1986; Hutchinson and Huberman 1993). Dissemination is a complex process whose success depends simultaneously on several dimensions like the dissemination agent's characteristics (e.g., its credibility), the disseminated product (e.g., relevance of research results for users), the final user's characteristics (e.g., personal motivation to use research results), the communication channels used (e.g., collaboration networks), the communication format (e.g., presentations, reports, etc.), as well as the resources allowed for these activities (e.g. time, human and financial resources) (Huberman and Gather-Thurler 1991; Kirst 2000). Failing to take these dimensions into account, is often cited as one of the reasons why research results are under-utilized by practitioners in education (Boostrom et al. 1993; Hemsley-Brown 2004; Wikeley 1998; Willmott 1994).

Knowledge reception refers to the user's first contact with the knowledge generated, adapted and disseminated by the researcher. The success of this step largely rests on the previous steps researchers' endeavour in order to make research results easily accessible for, and understandable by users (Barnett 2005; Bickel and Cooley 1985; Hemsley-Brown and Sharp 2003). However, the effectiveness of this step also requires the awareness of knowledge receivers (Rogers 1995 cited by Hemsley-Brown and Sharp 2003). This awareness depends primarily on the interest the users have for research results and the concrete needs these research results could eventually satisfy (Roy et al. 1995).

Knowledge adoption is the next step in the knowledge transfer process. The adoption concept is mainly investigated in the literature on innovations' adoption (Roy et al. 1995). As defined by Rogers (1983), cited by Roy et al. (1995), adoption refers to the path an individual, or any other decision-making unit, uses to pass through the process of 1) having a first level of awareness of the existence of an innovation, 2) forming an attitude towards the innovation, 3) making a decision whether to adopt or reject the innovation, 4) implementing the new idea, and 5) finally, confirmation of the adoption decision. The determinants of adoption have been widely documented in the literature on innovation diffusion, especially through Rogers' works (Hemsley-Brown and Sharp 2003). In the context of knowledge transfer, the adoption determinants include the motivation of the receiver to use or not use the new knowledge, the degree of resistance to external knowledge, the actors' leadership, the compatibility with existing policies and practices, the availability of resources, etc.

Finally, knowledge utilization refers to the application of the knowledge generated, adapted, and disseminated by the researcher, and received and adopted by the user in order to achieve specific goals and objectives (Bickel and Cooley 1985; Love 1985). Beyer and Trice (1982), cited by Roy et al. (1995), distinguish three forms of knowledge utilization: 1) instrumental utilization (research results are used to solve concrete problems or to meet specific needs), 2) conceptual utilization (knowledge is used to support and provide food for thought), and 3) symbolic utilization (knowledge is used to legitimate, justify and support decision making). Several studies (e.g. Bickel and Cooley 1985; Hemsley-Brown 2005; Huberman and
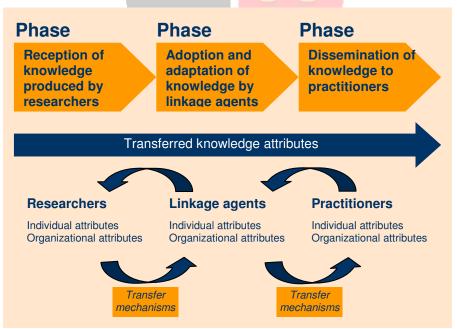
Gather-Thurler 1991; Herrington 1998; Kirst 2000) found that these three forms of knowledge utilization apply to the education context.

It is worth noting that even though the knowledge transfer process is presented here as a linear one, it is seldom the way it occurs in practice. As argued by Roy et al. (1995), each step in the process often requires continuous iterations, therefore feedback loops are necessary. However, the sequential presentation is often used instead of the cyclic one, mainly because it facilitates the knowledge transfer process description.

**The knowledge transfer process according to the linkage agents' perspective (researchers-linkage agents-users)**

The reality of knowledge transfer in education shows that there is still a large gap between research and practice. In spite of the huge amount of knowledge generated by researchers, research results often fail to effectively come through the subsequent steps of the knowledge transfer process. This makes their utilization by users a low probable event. To overcome this shortcoming, the role that could play the linkage agent as an intermediary actor between researchers and users becomes critical (Roy et al. 1995). Linkage agents, also called knowledge brokers, boundary-spanners, gatekeepers, or translators in the education literature (Brown and Duguid 1998), are individuals that have contact with both researchers and users, and could then build a bridge allowing a better interaction between them.

**Figure 7. Determinants of knowledge transfer in education according to the linkage agents' perspective**



As noticed earlier, the linkage agents' perspective suggests that researchers disseminate their research results to linkage agents, whose role is then to facilitate their transfer and diffusion to users. The intermediation role of the linkage agents means that the knowledge transfer process is composed of two dyadic ones: a transfer process between researchers and the linkage agent, and another one between the latter and practitioners. Hence, the global knowledge transfer

process could be conceived in three main phases (Figure 7). In phase 1, linkage agents receive the knowledge produced and disseminated by researchers. Then, they adopt and adapt this knowledge to practitioners' conditions and context (phase 2), before disseminating it to knowledge practitioners (phase 3).

## Determinants of Knowledge Transfer in Education

The reviewed studies allow to bring out several determinants of knowledge transfer in education. Having conceived knowledge transfer as a three-phase these determinants are presented according to these phases. This study suggests three main categories of determinants of the knowledge transfer process in education: 1) the determinants related to the transferred knowledge attributes, 2) those related to the characteristics of actors involved in the knowledge transfer process (i.e., researchers, linkage agents and practitioners), and 3) the determinants related to the transfer mechanisms (Figure 7).

### Determinants related to transferred knowledge attributes

The determinants of knowledge transfer related to the transferred knowledge attributes correspond to the characteristics that this knowledge should have in order to facilitate its transfer between actors. The review of the included studies reveals several transferred knowledge attributes that have a direct impact on the knowledge transfer process effectiveness and results. First, the transferred knowledge should be easy to understand by the receiver. It should use appropriate simple, precise and clear language and be supported by concrete examples and experiences (Kilgore and Pendleton 1993; Kirst 2000). Explicit and codified knowledge is certainly easier to transfer and to explain than tacit knowledge, since it is often supported by formal conceptual frameworks and accurate language (words, numbers, symbols, graphs, etc.) (Rynes et al. 2001). However, Benjamin Martz and Shepherd (2003) argue that in education, explicit knowledge is not sufficient and should, most of the time, be supported by tacit knowledge in order to ensure a successful transfer process. This is because in education, knowledge transfer is often about personal and collective experiences as well as best practices, which give practical value to knowledge users (Abdoulaye 2003, Anis et al. 2004).

The transferred knowledge should also be applicable to the education context in order to help its transfer. Hemsley-Brown and Sharp (2003) show that the lack of applicability of the transferred knowledge is one of the most important barriers to its adoption and utilization by potential users. Applicability involves that knowledge consider the specificities of the education context (values, ideologies, practices, etc.), answer specific users' needs, and be easily usable by practitioners (Bickel and Cooley 1985; Kirst 2000; Lloyd et al. 1997; Love 1985).

The effectiveness of knowledge transfer in education also depends on its accessibility. When the information coming from research is easily available and accessible, this makes it easier for practitioners to use it. Accessibility here is not only related to the physical availability of knowledge, but also to its intellectual accessibility (Hemsley-Brown 2004). The impressive number of scientific papers and research reports published on education could be a serious barrier to their use by practitioners (Hemsley-Brown and Sharp 2003). It then becomes important for the linkage agent to assess the relevance of the available knowledge, and to make syntheses of pertinent research results before disseminating them in a simple and clear way to users.

Another important attribute of the knowledge that could have an important impact on the effectiveness of its transfer, is its relevance. Relevance means that knowledge should be interesting, credible and produced at the opportune time. According to some authors, the relevance of the transferred knowledge plays an important role to ensure the effectiveness of its transfer, and could contribute to bring researchers and users closer (Abdoulaye 2003; Boostrom et al. 1993; Carter and Doyle 1995; Love 1985). Hemsley-Brown (2004) argues that the research design has an important impact on the degree of relevance of its results as perceived by practitioners. When the research is conducted according to users' needs and involves practitioners in the early stages of the research process, the results could be perceived as more relevant by users (Lloyd et al. 1997). According to Boostrom et al. (1993), relevant and useful results are not abundant in the educational field. It is then important for future research to put emphasis on the relevance, and usefulness, of their research for practitioners to ensure a better knowledge transfer.

**Actors' related determinants**

The review of the included studies allows for the identification of several determinants of knowledge transfer that are related to the actors involved in the process (i.e. researchers, linkage agents, and practitioners). These determinants are presented by distinguishing for each actor, those related to the individuals and those concerning the organizational context. While the first determinants are related to the actors themselves, the second ones concern the institutional characteristics of the organization to which those actors belong.

**Researchers' related determinants**

Determinants related to researchers concern the endeavours that these researchers as well as their institutions should make, in order to facilitate the transfer of their research results to linkage agents or practitioners. At the individual level, the adaptation, contextualization and dissemination efforts made by the researcher are crucial determinants of the process of knowledge transfer in education (Hemsley-Brown 2004; Bickle and Cooly 1985; Love 1985; Huberman 2000; Anderson and Franklin 2000; Ozga 2004; Anderson 1992; Abdoulaye 2003). It is then important that researchers allocate the necessary time to bring to fruition these activities. Researchers' credibility also has a significant impact on the transfer of their research results. This credibility is often developed with time due to sustained interactions between researchers and the other actors involved in the knowledge transfer process (Huberman 1987; 1990).

At the organizational level, the determinants of knowledge transfer are mainly related to the experience of the research organization (university, research center, etc.) with knowledge transfer activities (Anis et al. 2004), as well as the importance and the recognition given by the organization to these activities (Abdoulay 2003). Therefore, research organizations willing to collaborate with linkage agents and/or practitioners in education, should implement incentive policies and release the necessary resources (time, funding, etc.) to encourage their researchers to engage in knowledge transfer activities.

**Linkage agents' related determinants**

As mentioned above, linkage agents play a crucial role in the knowledge transfer process as intermediaries between researchers and end users. Therefore, the effectiveness of the process depends largely on the attributes of these linkage agents, both at the individual and the organizational level.

The literature on knowledge transfer in education shows that the professional experience, the cognitive abilities, the social capital as well as some personal attributes of the linkage agents, are important determinants of knowledge transfer. Obviously, linkage agents should have some experience in knowledge transfer activities (Anis et al. 2004; Beier and Ackerman 2005). This experience develops with time, but could also be acquired through participation in thematic conferences, seminars and workshops (Matzat 2004). The cognitive abilities of linkage agents, refer to their capacity to grasp and assess the quality of research results, as well as their ability to select pertinent research issues according to the education context and stakes (Hemsley-Brown 2004; Kilgore and Pendleton 1993; Miller et al. 1994). The cognitive abilities of linkage agents are an important determinant of knowledge transfer in education, since they have a direct impact on the adoption and adaptation efforts they make, before disseminating knowledge to practitioners (Hemsley-Brown 2004; Miller et al. 1994; Kilgore and Pendleton 1993). The cognitive capacities of linkage agents could be reflected by the graduate academic degrees they earned which indicate their familiarity with the research process and results.

The social capital held by linkage agents is another determinant of knowledge transfer in education. It refers to interactions, partnerships and collaborations they develop with researchers and practitioners (Ozga 2004; Hammett and Collins 2002; Rynes et al. 2001; Chickering and Gamson 1999; Love 1985). Social capital could be enhanced through face-to-face meetings and electronic interactions between actors (Chickering and Gamson 1999; Hammett and Collins 2002), but also with social events and activities (Rynes et al. 2001). Finally, the reviewed studies reveal some other personal attributes that determine the effectiveness of knowledge transfer in education. This includes the linkage agents' positive attitude toward research (Gauquelin and Potvin 2006), their leadership (Hemsley-Brown 2004; 2005), and their openness to newness and change (Ozga 2004).

In addition to these individual attributes, some characteristics related to the organization to which the linkage agent belongs are also important to ensure the effectiveness of knowledge transfer. These organizational determinants particularly concern the organizational structure and context, as well as the resources and policies dedicated to knowledge transfer activities. Organizations showing a low degree of centralization and formalization are more likely to succeed in their knowledge transfer activities (Browne 2005). Moreover, bureaucratic procedures and the lack of support and negatives pressures from colleagues, figure among the major obstacles to knowledge transfer (Browne 2005; Barnard et al. 2001). It then becomes important to the linkage agent's organization to develop and sustain a culture that encourages collaboration and information-sharing, in order to improve the effectiveness of knowledge transfer (Lloyd et al. 1997).

Financial, human, and physical resources are also mentioned as important determinants of knowledge transfer in education (McPherson and Nunes 2002; Patricia 2000; Abdoulaye 2003; Powers 2003; Hemsley-Brown 2004). The time allowed for knowledge transfer activities is also an important factor of their success. Hemsley-Brown (2004) argues that one of the factors constraining knowledge transfer and utilization in education is the lack of time, for linkage agents, to read, understand, adapt and disseminate research results. Finally, the examination of the articles included in our systematic review shows that organizations having established

internal policies to encourage knowledge transfer activities between and by their employees, succeed better in transferring knowledge than those that do not have such policies (Huberman 1983; Wikeley 1998; Abdoulaye 2003; Miller et al. 1994). These policies could consist in financial incentives, promotion opportunities or training for members engaged in knowledge transfer activities (Huberman 1983; Abdoulaye 2003).

Practitioners' related determinants

Practitioners (i.e., teachers, pedagogic counsellors, etc.) are the end users of the knowledge produced by researchers and adopted, adapted and disseminated by linkage agents. The reviewed studies show that some determinants of knowledge transfer are related to practitioners' individual and organizational attributes. Once again, the time allowed by practitioners to acquire and adopt new knowledge is an important determinant of knowledge transfer. As argued by Hemsley-Brwon (2004), the lack of time is one of the barriers preventing practitioners from going through transferred knowledge. Practitioners' adoption and use of knowledge are also conditioned by their motivation to do this. Some authors (e.g. Baldwin and Ford 1988; Nyden and Wiedel 1992) suggest enhancing this motivation by establishing a reward system that encourages practitioners to use and implement new practices and programs in their immediate context. The implication of practitioners at an early stage in the research process is another determinant of their adoption and utilization of research results, since it allows them to better understand these research results (Huberman 2002; Hemsley-Brown and Sharp 2003). Finally, the practitioners' competencies in research are another determinant of knowledge transfer towards educational establishments (Collinson et al. 2003). Therefore, training should be offered to practitioners in order to allow them to develop linkages with researchers and linkage agents, and also to get used to research results (Huberman and Gather-Thurler 1991).

At the organizational level, the organizational climate, culture, structure, procedures, and resources are among the cited factors as determinants of knowledge transfer in education (Alexander 2000; Ben-Peretz 1994; Bickel and Cooley 1985; Huberman 1987; 1990). The organizational climate could act as a facilitator, or an obstacle to knowledge transfer. Some situations, like a lack of organizational support to knowledge activities, a lack of explicit implication of managers in the process, and a negative attitude towards research, could prevent knowledge transfer to schools (Barnard et al. 2001; Bickel and Cooley 1985). As for the organizational culture, the education field is often characterized by a shortage of time for practitioners to plan their activities, a rigid timetable, a predetermination of curriculum, content and materials, and an emphasis on order which are all factors that impede knowledge dissemination towards practitioners (Ben-Peretz 1994). In addition, the success of knowledge transfer depends on the perception that the practitioners have of the benefits of the research results on their context and practices (Huberman 1983). However, most of the time, practitioners rarely perceive these benefits due to their often busy schedule. The consequence is a lack of attention given to research results by practitioners.

An important obstacle to knowledge transfer in education is the large gap between researchers and practitioners (Huberman 1983; 1987; 1990; Ben-Peretz 1994). Most of the time, practitioners perceive researchers as belonging to a theoretical world which is far from the concrete context of educational establishments and systems. It then becomes important to try to bring the two communities (i.e. researchers and practitioners) closer, in order to reduce this gap and create a better atmosphere for cooperation and knowledge transfer (Hemsley-Brown and Sharp 2003; Miller et al. 1994). Finally, it's worth noticing the importance of physical, financial and human resources as determinants of knowledge transfer. When practitioners have, at their

disposal, adequate resources, it could help them to better acquire, adopt and use new knowledge (McPherson and Nunes 2002; Powers 2003).

The actors' related determinants of knowledge transfer in education are summarized in table 1.

**Table 1. Actors' related determinants of knowledge transfer in education**

| Actors | Individual attributes | Organizational attributes | Selected references |
|---|---|---|---|
| Researchers | - Adaptation efforts<br>- Contextualization efforts<br>- Dissemination efforts<br>- Researchers' credibility | - Experience in knowledge transfer<br>- Emphasis given to knowledge transfer | Abdoulaye (2003); Anderson & Franklin (2000); Anis et al. (2004); Hemsley-Brown (2004); Hubeman (2000); Ozga (2004) |
| Linkage agents | - Professional experience<br>- Cognitive abilities<br>- Social capital<br>- Personal attributes | - Organizational structure<br>- Resources dedicated to knowledge transfer<br>- Policies to encourage knowledge transfer | Anis et al. (2004); Beier & Ackerman (2005); Chickering & Gamson (1999); Hammett & Collins (2002); Hemsley-Brown (2004); McPherson & Nunes (2002); Matzat (2004); Rynes et al. (2001) |
| Practitioners | - Time allowed to acquire and adopt new knowledge<br>- Motivation to acquire and adopt new knowledge<br>- Ability to understand research results | - Organizational climate<br>- Organizational culture<br>- Organizational structure<br>- Organizational procedures and policies<br>- Organizational resources | Ben-Peretz (1994); Bickel & Cooley (1985); Collinson et al. (2003); Hemsley-Brown (2004); Huberman (1987; 1990); Huberman & Gather-Thurler (1991) |

## Determinants related to transfer mechanisms

Transfer mechanisms consist of all the means through which knowledge moves along the knowledge transfer process. They allow actors (i.e. researchers, linkage agents and practitioners) to exchange knowledge and information. The reviewed literature shows that there are several mechanisms that could be used to promote knowledge transfer in education, but also that these transfer mechanisms have an impact on the effectiveness and the success of the knowledge transfer process. Two categories of transfer mechanisms are distinguished in the literature: 1) the information mechanisms, and 2) the interaction mechanisms.

Information mechanisms refer to the ways used to acquire or disseminate knowledge without personal interaction with other actors. This includes, for example, research reports, scientific papers, professional journals, information reports, best practices guides, education tools, emails, blogs, etc. (Argote et al. 2000; Bickel and Cooley 1985; Huberman 2002; Kirst 2000; Neville and Warren 1986). Abdoulaye (2003) suggests the creation of a central database of good practices and innovations developed in education as a solution to optimize knowledge management and transfer. He argues that an adequate conception and presentation of these databases, along with an available access for practitioners, would encourage the latter to use new knowledge and practices.

As for interaction mechanisms, they consist of the ways used to acquire or disseminate knowledge by relying on personal interactions with other actors. Some examples of interaction knowledge transfer mechanisms are oral presentations, academic conferences, seminars, professional colloquiums, workshops, training sessions, formal meetings, informal discussions, social activities, etc. (Boostrom et al. 1993; Chazan et al. 1998; Hemsley-Brown and Sharp 2003; Neville and Warren 1986; Ozga 2004). Interaction mechanisms are very important to ensure the success of knowledge transfer, especially in education where transfer concerns tacit knowledge, experiences and competencies most of the time. This kind of transfer requires an iterative, interactive and reflexive process between actors. Implementing an educational reform, for example, calls for creating opportunities to test and discuss pedagogic changes that this reform entails (Omar El-Sheikh 2000). These opportunities allow practitioners not only to adopt the new knowledge, but also to share their experiences and to develop a collective new practice in a new educational structure (Briscoe and Peters 1997; Hammett and Collins 2002; Kahne and Westheimer 2000; Serafini 2000; Wagner 2003). Training sessions are probably the most suitable knowledge transfer mechanism in education (Argote et al. 2000). They allow practitioners to develop new abilities related to the application of new knowledge in concrete work situations (Barnard et al., 2001). This should increase their interest in new knowledge and consequently its adoption and use.

**Discussion and Implications**

Knowledge transfer is critical to improve policies and practices in education. Our findings suggest that linkage agents are central actors in the knowledge transfer process. Actually, the knowledge to be transferred in the education field is diversified. It includes pedagogic programs and reforms as well as factual, interpersonal and conceptual knowledge. In many cases, the complexity of the knowledge produced by researchers could make it difficult for practitioners to understand and adopt it. Hence, the intervention of linkage agents becomes essential in order to adapt the knowledge produced by researchers and to make it easier for practitioners to adopt and use it.

Along with the major role played by linkage agents, the effectiveness of knowledge transfer in education also depends on other factors. Our findings suggest that, in education, the determinants of knowledge transfer could break down into three major categories, namely: 1) determinants related to transferred-knowledge attributes, 2) those related to the actors involved in the process (i.e., researchers, linkage agents and practitioners), and 3) determinants related to transfer mechanisms. Determinants are by definition intervening variables in the sense that the presence of each one of them could increase the effectiveness and/or the efficiency of the knowledge transfer process. Thus, managers and policy-makers could use these determinants as levers to improve their knowledge transfer strategies and practicies.

The determinants related to the transferred-knowledge attributes suggest that linkage agents should ensure that the knowledge to be transferred to practitioners is intellectually and physically accessible to them. This knowledge has to be applicable and easily adaptable to the practitioners' specific context. The actors' related determinants suggest that, when interacting with researchers, linkage agents have to choose, as much as possible, those who make every endeavour to adapt, contextualize and disseminate their research results. They should also choose those researchers who maintain sustainable interactions with the practice sphere. In addition,

linkage agents have to interact more with researchers coming from research organizations that possess good experience, and encourage and promote knowledge transfer activities.

In addition, in order to improve knowledge transfer in education, linkage agents have to allow the necessary time for their transfer activities. They also have to regularly attend academic and training programs in order to update their competencies and maintain cognitive abilities allowing them to follow, understand and utilize the knowledge coming from research. Another important issue for linkage agents is to maintain regular and repetitive interactions with practitioners, and to create communication and exchange opportunities between researchers and practitioners. On the organizational side, knowledge transfer organizations have to be able to identify research results from multiple sources (universities, colleges, research centers, etc.), and promote a culture of information-sharing and exchange inside their organization, as well as with researchers and practitioners. They also have to provide the necessary resources and to set up policies that encourage and promote knowledge transfer activities.

In order to improve the knowledge transfer process, linkage agents also have to use a language that is simple and common to practitioners when adapting research results. Their adaptation efforts should lead to information presented in a synthesized, attractive and comprehensible way. Moreover, linkage agents should encourage interactions between practitioners. They should also promote a culture of critical thinking, questioning and debating within the practice sphere. In addition, linkage agents have to explain to practitioners the potential impacts of reforms and changes, and create opportunities to test the proposed changes in situ before generalizing them on a larger scale. It's also important to use multiple mechanisms when communicating and transferring knowledge with researchers and practitioners. These mechanisms could be simply informative (e.g., reports, scientific papers, web sites, etc.) or designed to foster interaction between actors (e.g., oral presentations, conferences, workshops, training sessions, seminars, etc.).

Finally, it's worth noticing that our results are based on the best available knowledge on knowledge transfer in education. However, it should berecognize that in practice, each agency, each organization and each establishment is specific and particular. That is why the authors propose to consider our results as avenues to improve knowledge transfer in education and to be conscious that they could, and should be enriched according to the specific context of users.

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**Appendix. Electronic Search Strategy**

**1. Databases' Description (source: web site of Laval university library, www.bibl.ulaval.ca)**

MULTIDISCIPLINARY DATABASES.

- ProQuest ABI/INFORM global. This database indexes about 1800 economical journals from around the world.
- EBSCO. The search was done within the following sub-databases:
  - o *Business Source Premier (BSP)*. This database covers economic and business fields. It indexes the full text of thousands of peer-reviewed and academic journals.
  - o *Academic Search Premier (ASP)*. It indexes about 4600 periodicals in major knowledge fields.
  - o *Educational Resources Information Center (ERIC)*. It includes abstracts of articles coming from more than 900 scientific journals including Current Index to Journals in Education (CIJE) and Resources in Education (RIE).
- ISI Web of Science. This database indexes the main journals in the fields of sciences, social sciences and arts.

DATABASES SPECIALIZED IN EDUCATION.

- Education Abstracts. This database indexes the abstracts of published works on education.
- CBCA Education (via CBCA complete). This database allows access to a large variety of Canadian periodicals dedicated to education.

**2. Search Strings**

SEARCH STRING 1

(knowledge **OR** information **OR** research **OR** practice **OR** results **OR** findings) **AND** (transfer **OR** utilization **OR** dissemination **OR** diffusion **OR** adoption **OR** adaptation **OR** translation **OR** assimilation **OR** acquisition **OR** sharing **OR** generation) **AND** (educ* **OR** training **OR** school **OR** scholar **OR** teach* **OR** learning **OR** pedagogi* **OR** academic **OR** curriculum **OR** formation)
[*The symbol (*) indicates that all the words having as a root the set of characters preceding it are located by the search engine*]

SEARCH STRING 2

(connaissance **OR** information **OR** recherche **OR** pratique **OR** résultat **OR** savoir) **AND** (transfert **OR** utilisation **OR** dissémination **OR** diffusion **OR** adoption **OR** adaptation **OR** vulgarisation **OR** assimilation **OR** acquisition **OR** partage **OR** génération) **AND** (éduc* **OR** formation **OR** école **OR** scolaire **OR** enseign* **OR** apprentissage **OR** pédagog* **OR** académique **OR** curriculum)
[*This search string is the French equivalent of the search string 1*]

SEARCH STRING 3

pedagog* W3 chang*
[*The symbol W3 indicates that the two words it links have not to be separated in the text by more than three words. This technique was used in order to avoid the unlimited number of research documents dealing with changes others than pedagogic*]

### 3. Search strategy

In order to keep the number of retrieved documents under control, and following Thorpe et al. (2005), the following search strategy was adopted:
- The initial search with each search string is done in the documents' title, abstract and keywords;
- If more than 1500 documents are obtained, the search is restricted to documents' title and abstract;
- If more than 1500 documents are obtained, the search is restricted to documents' abstract;
- If more than 1500 documents are obtained, the search is restricted to documents' title.