

13^e colloque international en déducation
Montréal – 8 mai 2026

Projet DOUG

Explorer les potentialités de l'intelligence artificielle pour renforcer les compétences psychosociales favorable à la collaboration interprofessionnelle en santé

**Jean HEUTTE¹, Marjolaine CHAGROT¹, Gaëlle MOLINARI², Michel DESMARAIS³, Patrick LAVOIE⁴,
Ilian CRUZ-PANESSO⁵, Fabien FENOUILLET⁶, Anthony CHERBONNIER¹ et Jérôme GUÉRIN⁷**

¹ CIREL, Faculté de Psychologie, des Sciences de l'Education et de la Formation, Université de Lille, France

² TECFA, Faculté de Psychologie et des Sciences de l'Education, Université de Genève, Suisse

³ Département de Génie informatique, École Polytechnique de Montréal, Canada

⁴ Chaire de recherche du Canada sur l'apprentissage de la prise de décision infirmière et Faculté des Sciences Infirmières, Université de Montréal, Canada

⁵ CRPS, Direction de l'enseignement et de l'Académie CHUM, Université de Montréal, Canada

⁶ LINP2-2APS, UFR des Sciences Psychologiques, des Sciences de l'Education, Université Paris-Nanterre, France

⁷ CREAD, Faculté des Sciences du Sport et de l'Education, Université de Bretagne Occidentale, France

Concevoir des systèmes d'intelligence artificielle pour l'apprentissage humain
dans l'objectif de promouvoir « une relation synergique
entre les capacités cognitives humaines et l'intelligence artificielle »
(Nguyen *et al.*, 2024, p. 244) ?

Quelques éléments de contexte socio historiques...

La naissance de la société de l'information (Otlet, 1934)

TRAITÉ DE DOCUMENTATION LE LIVRE SUR LE LIVRE

THÉORIE ET PRATIQUE

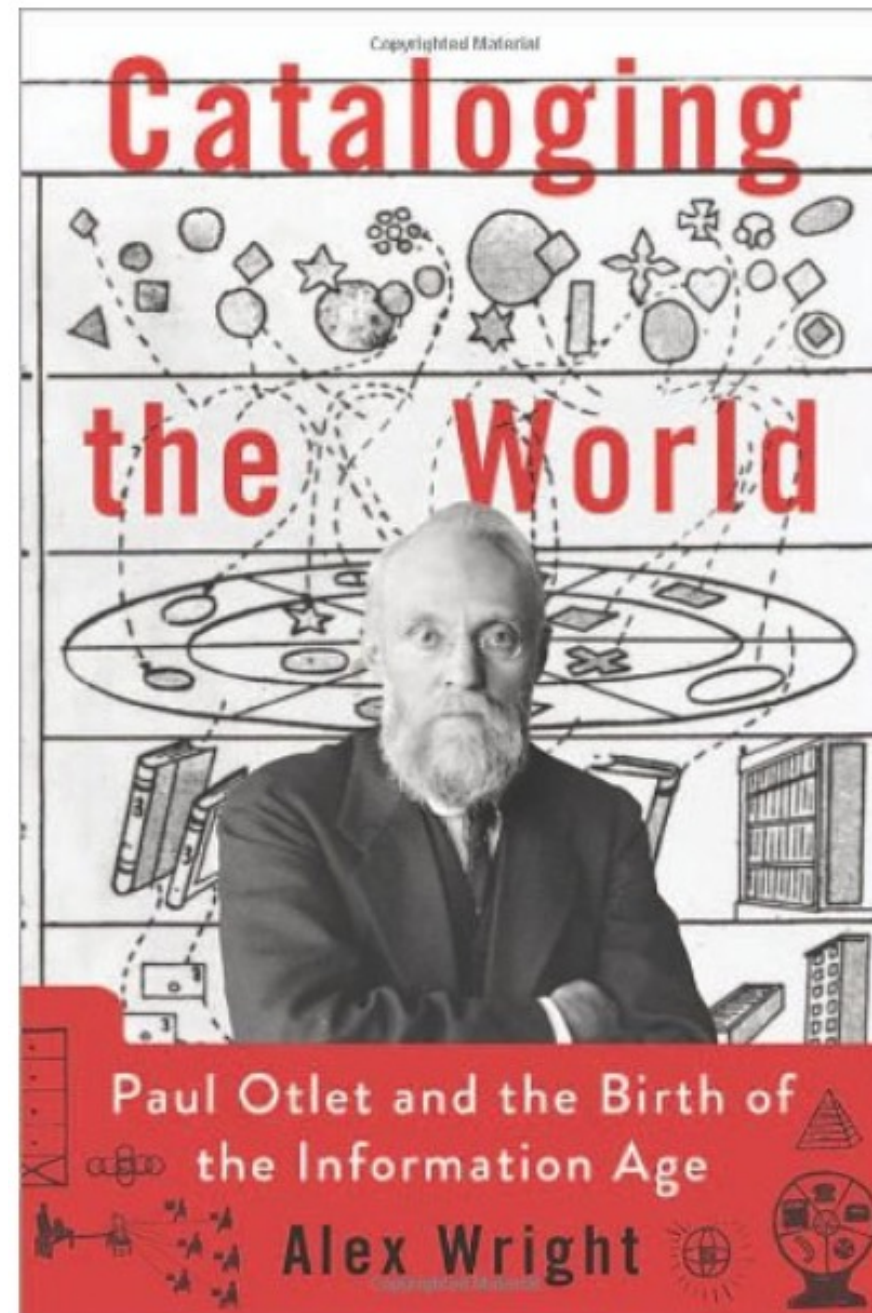
PAR
PAUL OTLET

Les Livres et les Documents. — La Lecture, la Consultation et la Documentation. — Rédaction, Multiplication, Description, Classement, Conservation, Utilisation des documents. — Édition et Librairie; Bibliographie, Bibliothèque, Encyclopédie, Archives, Muséographie documentaire, Documentation administrative. — Organismes, organisation, coopération. — Office et Institut International de Bibliographie et de Documentation. — Réseau Universel d'Information et de Documentation.

[002 (02)]



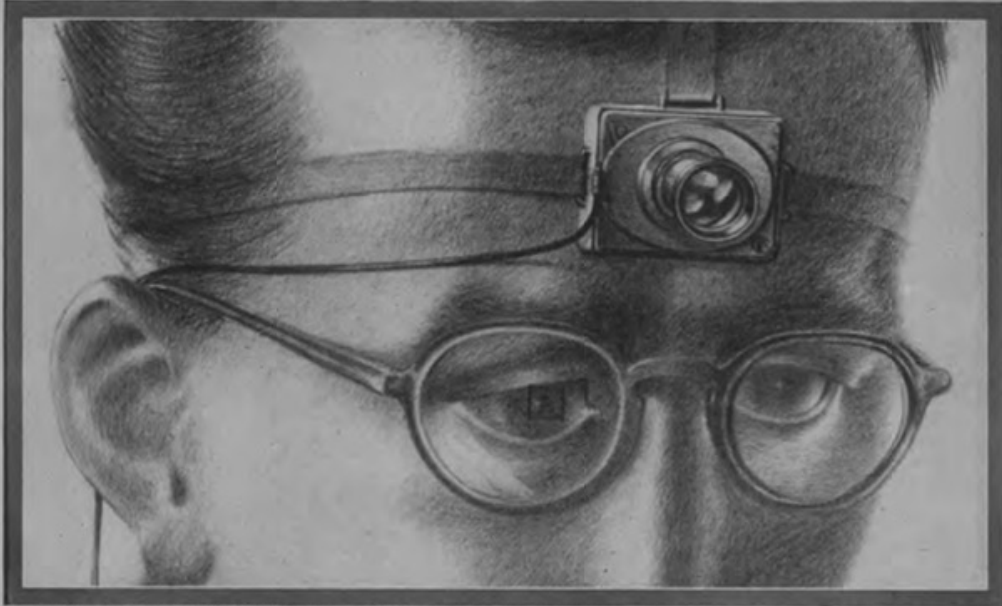
EDITIONS MUNDANEUM
PALAIS MONDIAL
BRUXELLES
1934



« Inventer une machine qui serait un cerveau mécanique et collectif »

Une mémoire élargie (Bush, 1945)

« Pensez à un futur appareil
[....]
dans lequel un individu
stocke tous ses livres,
dossiers et communications,
et qui est mécanisé de sorte
qu'il puisse être consulté
avec une vitesse
et une flexibilité supérieure.
C'est un supplément intime
élargi à sa mémoire.. »



A SCIENTIST OF THE FUTURE RECORDS EXPERIMENTS WITH A TINY CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE SMALL SQUARE IN THE EYEGLASS AT THE LEFT SHOWS THE OBJECT

AS WE MAY THINK

A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD IN WHICH MAN-MADE MACHINES WILL START TO THINK

by VANNESVAR BUSH

DIRECTOR OF THE OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT
Condensed from the Atlantic Monthly, July 1945

This has not been a scientists' war; it has been a war in which all have had a part. The scientists, burying their old professional competition in the demand of a common cause, have shared greatly and learned much. It has been exhilarating to work in effective partnership. What are the scientists to do next?

For the biologists, and particularly for the medical scientists, there can be little indecision, for their war work has hardly required them to leave the old paths. Many indeed have been able to carry on their war research in their familiar peacetime laboratories. Their objectives remain much the same.

It is the physicists who have been thrown most violently off stride, who have left academic pursuits for the making of strange destructive gadgets, who have had to devise new methods for their unanticipated assignments. They have done their part on the devices that made it possible to turn back the enemy. They have worked in combined effort with the physicists of our allies. They have felt within themselves the stir of achievement. They have been part of a great team. Now one asks where they will find objectives worthy of their best.

• • •

There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial.

Professionally our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose. If the aggregate time spent in writing scholarly works and in reading them could be evaluated, the ratio between these amounts of time might well be startling. Those who conscientiously attempt to keep abreast of current thought, even in restricted fields, by close and continuous reading might well shy away from an examination calculated to show how much of the previous month's efforts could be produced on call.

Mendel's concept of the laws of genetics was lost to the world for a generation because his publication did not reach the few who were capable of grasping and extending it. This sort of catastrophe is undoubtedly being repeated all about us as truly significant attainments become lost in the mass of the inconsequential.

Publication has been extended far beyond our present ability to make real use of the record. The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships.

But there are signs of a change as new and powerful instrumentalities come into use. Photocells capable of seeing things in a physical sense, advanced photography which can record what is seen or even what is not, thermionic tubes capable of controlling potent forces under the guidance of

lost power than a mosquito uses to vibrate its wings, cathode-ray tubes rendering visible an occurrence so brief that by comparison a microsecond is a long time, relay combinations which will carry out involved sequences of movement more reliably than any human operator and thousands of times as fast—there are plenty of mechanical aids with which to effect a transformation in scientific records.

Machines with interchangeable parts can now be constructed with great economy of effort. In spite of much complexity, they perform reliably. Witness the humble typewriter, or the movie camera, or the automobile. Electrical contacts have ceased to stick when thoroughly understood. Note the automatic telephone exchange, which has hundreds of thousands of such contacts, and yet is reliable. A spider web of metal, sealed in a thin glass container, a wire heated to brilliant glow—in short, the thermionic tube of radio sets is made by the hundred million, tossed about in packages, plugged into sockets—and it works! Its gossamer parts, the precise location and alignment involved in its construction, would have occupied a master craftsman of the guild for months; now it is built for 30¢. The world has arrived at an age of cheap, complex devices of great reliability, and something is bound to come of it.

A record, if it is to be useful to science, must be continuously extended, it must be stored and, above all, it must be consulted. Today we make the record conventionally by writing and photography, followed by printing; but we also record on film, on wax disks and on magnetic wires. Even if utterly new recording procedures do not appear, these present ones are certainly in the process of modification and extension.

NEW WAYS TO EXTEND THE RECORD—
THE CYCLOPS CAMERA AND DRY PHOTOGRAPHY

Certainly progress in photography is not going to stop. Faster material and lenses, more-automatic cameras, finer-grained sensitive compounds to allow an extension of the minicamera idea are all imminent. Let us project this trend ahead to a logical, if not inevitable, outcome. The camera bound of the future wears on his forehead a lump a little larger than a walnut. It takes a picture three millimeters square, later to be projected or enlarged. The lens is of universal focus, down to any distance accommodated by the unaided eye, simply because it is of short focal length. There is a built-in photocell on the walnut such as we now have on at least one camera which automatically adjusts exposure for a wide range of illumination. There is film in the walnut for a hundred exposures and the spring for operating its shutter and shifting its film is wound once for all when the film clip is inserted. It produces its results in full color. It may well be stereoscopic and record with two spaced glass eyes, for striking improvements in stereoscopic technique are just around the corner.

The cord which trips its shutter may reach down a man's sleeve within easy reach of his fingers. A quick squeeze, and the picture is taken. On a pair of ordinary glasses is a square of fine lines near the top of one lens, where it is out of the way of ordinary vision. When an object appears in that square, it is lined up for its picture. As the scientist of the future moves about the laboratory or the field, every time he looks at something worthy of the record, he trips the shutter and in it goes, without even an audible click. Is this all fantastic? The only fantastic thing about it is the idea of making as many pictures as would result from its use.

Will there be dry photography? It is already here in two forms. There have long been films impregnated with diazo dyes which form a picture without development, so that it is already there as soon as the camera has been operated. An exposure to ammonia gas destroys the unexposed dye, and the picture can then be taken out into the light and examined. The process is now slow, but someone may speed it up, and it has no grain difficulties such as now keep photographic researchers busy.

REDUCING THE WRITTEN RECORD
TO MANAGEABLE SIZE—MICROPHOTOGRAPHY

Like dry photography, microphotography still has a long way to go. The basic scheme of reducing the size of the record, and examining it by projection rather than directly, has possibilities too great to be ignored. The combination of optical projection and photographic reduction is already producing some results in microfilm for scholarly purposes, and the potentialities are highly suggestive. Today, with microfilm, reductions by a linear factor of 20 can be employed and still produce full clarity when the material is re-enlarged for examination.

Assume a linear ratio of 100 for future use. Consider film of the same thickness as paper, although thinner film will certainly be usable. Even under these conditions there would be a total factor of 10,000 between the bulk of the ordinary record on books, and its microfilm replica. The *Encyclopaedia Britannica* could be reduced to the volume of a matchbox. A library of a million volumes could be compressed into one end of a desk. If the human race has produced since the invention of movable type a total record, in the form of magazines, newspapers, books, tracts, advertising blurbs, correspond-

Dr. Vannevar Bush is head of the Office of Scientific Research and Development, which marshaled the scientific brains of the U.S. in the service of the war. As such he has performed one of the greatest, though most secret, jobs of the war, as important in its sphere as that of the Army chief of staff. Under his direction 6,000 scientists worked on such projects as the development of radar and the atomic bomb.

In the July issue of the *Atlantic Monthly* Dr. Bush published an article in which he set a great task for men of science in the peacetime world. Man has piled up a staggering body of knowledge—so staggering, in fact, that men of learning have great difficulty in finding and using the parts they want. It is the task of science, Dr. Bush says, to make this store of knowledge more available, to aid the human memory. Says the *Atlantic*: "Like Emerson's famous address of 1837 on 'The American Scholar,' this paper by Dr. Bush calls for a new relationship between thinking man and the sum of our knowledge."

LIFE is indebted to the editors of the *Atlantic Monthly* for permission to bring a condensed version of this important article to its larger audience.

WHAT DR. BUSH FORESEES

Cyclops Camera
Worn on forehead, it would photograph anything you see and want to record. Film would be developed at once by dry photography.

Microfilm
It could reduce *Encyclopaedia Britannica* to volume of a matchbox. Material cost 5¢. Thus a whole library could be kept in a desk.

Vocoder
A machine which could type when talked to. But you might have to talk a special phonetic language to this mechanical superscretary.

Thinking machine
A development of the mathematical calculator. Give it premises and it would pass out conclusions, all in accordance with logic.

Memex
An aid to memory. Like the brain, Memex would file material by association. Press a key and it would run through a "trail" of facts.

CONTINUED ON NEXT PAGE

Fondements de l'intelligence artificielle (McCarthy et al. 1955 ; Minsky, 1968)

A Proposal for the DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

June 17 - Aug. 16

We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.

The following are some aspects of the artificial intelligence problem:

1) Automatic Computers

If a machine can do a job, then an automatic calculator can be programmed to simulate the machine. The speeds and memory capacities of present computers may be insufficient to simulate many of the higher functions of the human brain, but the major obstacle is not lack of machine capacity, but our inability to write programs taking full advantage of what we have.

2) How Can a Computer be Programmed to Use a Language

It may be speculated that a large part of human thought consists of manipulating words according to rules of reasoning



John MacCarthy



Marvin Minsky



Claude Shannon



Ray Solomonoff



Alan Newell



Herbert Simon



Arthur Samuel



Oliver Selfridge



Nathaniel Rochester



Trenchard More

Les 10 "pères fondateurs" de l'IA en tant que discipline scientifique (juillet 1956)

« La science qui se fonde sur la conjecture que chaque aspect de l'apprentissage ou toute autre caractéristique de l'intelligence peut en principe être décrit avec une telle précision qu'une machine peut être fabriquée pour le simuler »
(McCarthy et al., 1955, p. I)

« La science qui consiste à faire faire par des machines des choses qui nécessiteraient de l'intelligence si elles étaient faites par des hommes. »
(Minsky, 1968, p. V)

Un cadre conceptuel pour soutenir la résolution de problèmes complexes (Engelbart, 1963)

CHAPTER 1

A CONCEPTUAL FRAMEWORK FOR THE AUGMENTATION OF MAN'S INTELLECT*

DOUGLAS C. ENGELBART
Stanford Research Institute, Menlo Park, Calif.

INTRODUCTION

By "augmenting man's intellect" we mean increasing the capability of a man to approach a complex problem situation, gain comprehension to suit his particular needs, and to derive solutions to problems. Increased capability in this respect is taken to mean a mixture of the following: that comprehension can be gained more quickly; that better comprehension can be gained; that a useful degree of comprehension can be gained where previously the situation was too complex; that solutions can be produced more quickly; that better solutions can be produced; that solutions can be found where previously the human could find none. And by "complex situations" we include the professional problems of diplomats, executives, social scientists, life scientists, physical scientists, attorneys, designers—whether the problem situation exists for twenty minutes or twenty years. We do not speak of isolated clever tricks that help in particular situations. We refer to a way of life in an integrated domain where hunches, cut-and-try, intangibles, and the human "feel for a situation" usefully coexist with powerful concepts, streamlined terminology and notation, sophisticated methods, and high-powered electronic aids.

This paper covers the first phase of a program aimed at developing means to augment the human intellect. These methods or devices can include many things, all of which appear to be but extensions of those developed and used in the past to help man apply his native sensory, mental, and motor capabilities. We consider the total system of a human

* Partial support of this work was received from the Air Force Office of Scientific Research, Directorate of Information Sciences, under Contract AF 49(638)-1024. This paper is an excerpt from a summary report (AFOSR-3223) which also includes a discussion of background material, a hypothetical description of a computer-based augmentation system, and research recommendations. The paper could never have been written without the considerable effort of Mrs. Rowena Swanson of the AFOSR, who extracted and organized the material upon which this chapter is based.

Par "augmenter l'intellect humain", nous entendons accroître la capacité d'un humain à aborder une situation problème complexe, à acquérir une compréhension adaptée à ses besoins particuliers et à trouver des solutions aux problèmes.

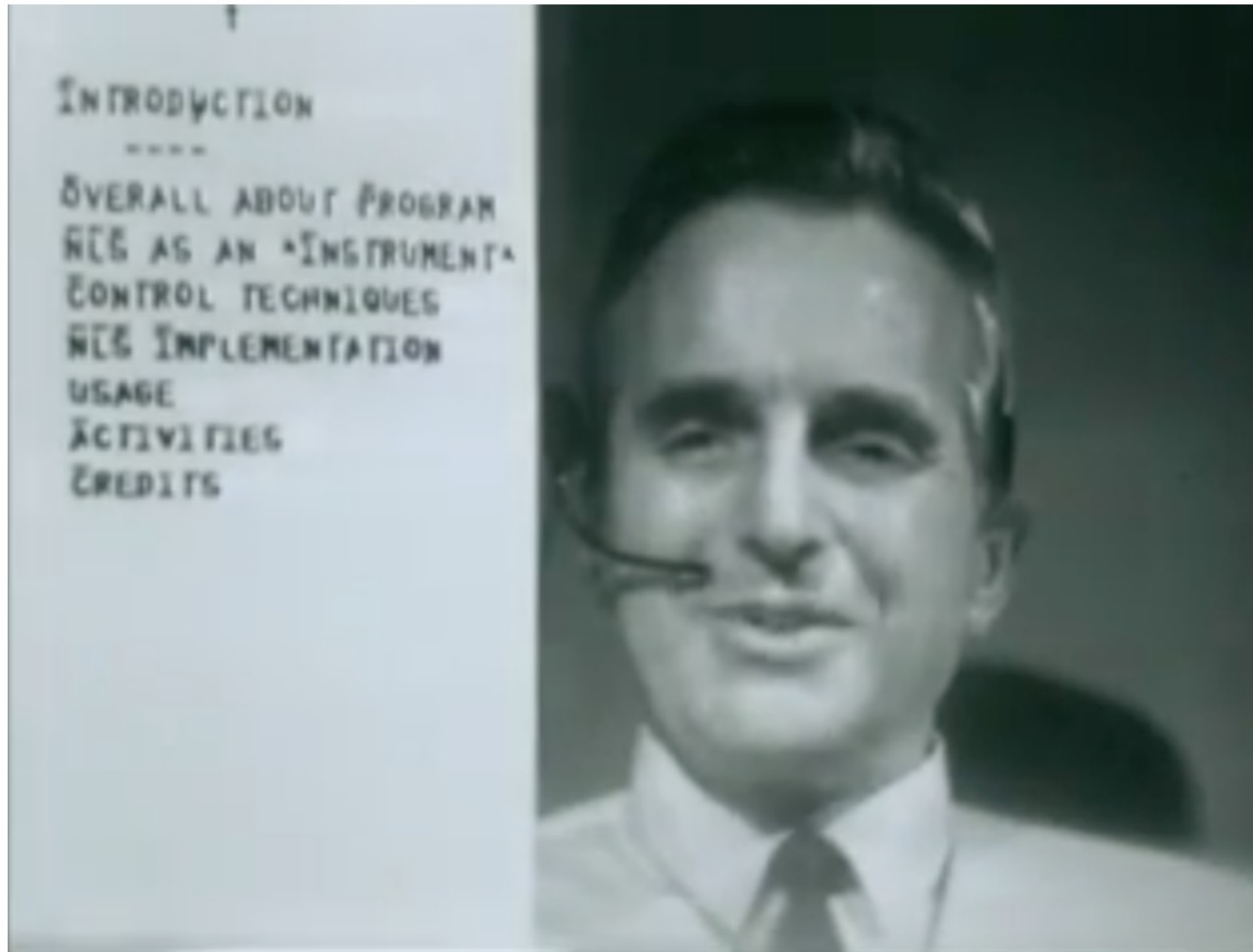
[...]

Et par "situations complexes", nous incluons les problèmes professionnels des diplomates, des cadres, des spécialistes des sciences sociales, des sciences de la vie, des sciences physiques, des avocats, des concepteurs...

[...]

Nous ne parlons pas d'astuces isolées qui s'avèrent utiles dans des situations particulières. Nous parlons d'un mode de vie dans un domaine intégré où les intuitions, les essais, les intangibles et le "ressenti" humain d'une situation coexistent utilement avec des concepts puissants, une terminologie et une notation simplifiées, des méthodes sophistiquées et des aides électroniques puissantes.

Augmenter l'intellect humain *via* l'outillage du travail collectif (Engelbart, 1968)



L'intelligence collective humaine techniquement augmentée (Levy, 2003)

« [...] l'étude et l'aménagement de
l'intelligence collective humaine techniquement augmentée
[...] constitue une interdiscipline
qui vise à faire dialoguer les savoirs sur l'homme
ainsi que les traditions techniques et artistiques afin de mieux comprendre,
et peut-être d'améliorer,
les processus d'apprentissage et de création collective »
(Levy, 2003, p. 105)

Intelligence hybride :

Coévolution et apprentissage entre humain et systèmes d'intelligence artificielle (Järvelä et al., 2025)

Author Manuscript

Corresponding author e-mail address: sanna.jarvela@oulu.fi

Hybrid Intelligence: Human–AI Co-evolution and Learning

Sanna Järvelä, Guoying Zhao, Andy Nguyen, & Haoyu Chen

University of Oulu, Finland

Introduction

Artificial intelligence (AI) is becoming increasingly ubiquitous in all areas of life. A concrete example is the urgent need to develop new educational practices in the post-pandemic world, as called for in the OECD 2021 Report on Digital Education (OECD, 2021). Furthermore, it has been estimated that more than half of the tasks associated with almost half of all jobs have been exposed to AI, and at least 19% of tasks associated with more than 80% of jobs have been exposed. As such, the potential of AI in enhancing expert work by supporting decision-making, automating routine tasks, and fostering innovation to solve complex problems has become increasingly evident. However, AI also introduces significant risks, such as the loss of human expertise, ethical concerns, and the potential for overreliance on automated systems (Filippucci et al., 2024). The emerging paradigm of hybrid intelligence (HI) can offer promising solutions that strike a balance between mitigating the negative impacts of AI disruption and supporting learners’ and workers’ re-skilling and upskilling in a world of growing population and societal challenges (Akata et al., 2020). However, current data-driven AI systems are still too narrow to help humans, lacking in social and emotional intelligence and restricted in their ability to produce realistic and applicable results (Klein & Philips, 2019). Humans are unique in that we are capable of creative and flexible thinking—connecting thinking and action to long-term aims, values, and purposes—and we can judge

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: [10.1111/bjet.13560](https://doi.org/10.1111/bjet.13560)

This article is protected by copyright. All rights reserved.

L'intelligence hybride est un champ de recherche qui cherche à combler le fossé entre l'intelligence humaine et l'IA.

En combinant les forces des humains et des machines, l'intelligence hybride vise à créer des systèmes plus performants que les humains ou les machines travaillant indépendamment les uns des autres.

En d'autres termes, l'intelligence hybride vise à combiner les forces des humains et des machines *via* leurs processus coévolutifs afin de collaborer, d'apprendre et de se renforcer mutuellement.

Pour y parvenir, il faut non seulement des innovations technologiques, mais aussi un réexamen critique de la manière dont nous alignons l'intelligence des machines sur les valeurs, l'éthique et les objectifs humains.

DOUG : renforcer les compétences psychosociales favorable à la collaboration interprofessionnelle en santé

En résonance avec le mouvement *Positive Artificial Intelligence in Education* (Bittencourt et al., 2024), qui préconise d'aligner les systèmes d'intelligence artificielle (SIA) sur l'engagement, le bien-être et un apprentissage significatif, le projet DOUG (référence aux travaux visionnaires de Douglas Engelbard (1963)) est un programme de recherche orienté par la conception (Sanchez et al., 2026) ayant pour finalité pragmatique la conception, le développement et l'évaluation d'un système d'intelligence artificielle (SIA) destiné à soutenir l'expérience optimale d'apprentissage (autotelisme-Flow, Heutte et al., 2021), les compétences psychosociales et la collaboration interprofessionnelle en santé (Cruz-Panesso et al., 2024), en contexte de résolution collaborative de problèmes (Molinari et al., 2017).

Bittencourt, I. I., Chalco, G., Santos, J., Fernandes, S., Silva, J., Batista, N., Hutz, C., & Isotani, S. (2024).

Cruz-Panesso, I., Brien, L.-A., & Drolet, P. (2024). *Les fenêtres interprofessionnelles : un modèle visant l'apprentissage de la confiance et de l'empathie interprofessionnelles par la simulation*, Congrès international francophone de pédagogie des sciences de la santé, Marrakech 5-7 juin 2024.

Positive Artificial Intelligence in Education (P-AIED): A roadmap. *International Journal of Artificial Intelligence in Education*, 34(3), 732–792. <https://doi.org/10.1007/s40593-023-00357-y>

Engelbart, D. C. (1963). A conceptual framework for the augmentation of man's intellect. *Vistas in information handling*, 1, 1-29.

Heutte, J., Fenouillet, F., Martin-Krumm, C., Gute, G., Raes, A., Bachelet, R. & Csikszentmihalyi, M. (2021). Optimal Experience in Adult Learning: Conception and Validation of the Flow in Education Scale (EduFlow-2). *Frontiers in Psychology, section Educational Psychology*, 12, 1-12. doi: 10.3389/fpsyg.2021.828027

Molinari, G., Avry, S., & Chanel, G. (2017). Les émotions dans les situations de collaboration et d'apprentissage collaboratif médiatisées par ordinateur. *Raisons éducatives*, 21(1), 175-190.

Sanchez, E., Bonnat, C., Bonvin, G., Jaouadi, M., Morard, S., Parmentier, H., Plumettaz-Sieber, Prior, E., Paukovics, E., & Senecail, A. (2026). *Recherche orientée par la conception en éducation : Modèles, méthodes, outils*. ISTE Group

Equipe projet Doug

- Marjolaine Chagrot, CIREL, Université de Lille (France)
- Ilian Cruz-Panesso, Direction de l'enseignement et de l'Académie du CHUM (Canada)
- Michel Desmarais, École Polytechnique de Montréal (Canada)
- Fabien Fenouillet, LINP2, Université de Nanterre (France)
- Nicolas Fernandez, Faculté de médecine de l'Université de Montréal (Canada)
- Jean Heutte, CIREL, Université de Lille (France)
- Patrick Lavoie, Faculté des sciences infirmières, Université de Montréal (Canada)
- Nassir Messadi, INTERACTIONS, Faculté de médecine, Université de Lille (France)
- Gaëlle Molinari, TECFA, Université de Genève (Suisse)

Projet soutenu par le **LAVIA** Laboratoire vivant d'innovation sur l'apprentissage
en enseignement supérieur

Projet Doug : proposition d'axe de recherche structuré en trois étapes

- **Évaluer la capacité d'un Système IA générative (SIAg)** à identifier, étiqueter et analyser des échanges interprofessionnels, *via* des modèles basés sur des grilles d'activités collaboratives observables (partage d'informations, négociation, régulation, maintien de la communication, etc.) sur lesquelles nous nous estimons en mesure de fonder un modèle évaluation systématique.
- **Explorer la capacité du SIAg à générer des dialogues interprofessionnels réalistes**, reflétant différents types de dynamiques :
 - des **collaborations efficaces** (décisions partagées, écoute active, régulation conjointe),
 - mais aussi des **collaborations inefficaces** (malentendus, conflits, déséquilibres de participation).

Ces dialogues constitueraient des **ressources pédagogiques**, utilisables comme supports d'analyse ou de mise en situation pour la formation des étudiant•e•s et/ou des professionnels en santé.

- **Tester l'utilisation du SIAg comme agent d'accompagnement en temps réel** dans des dialogues entre étudiant•e•s, avec l'objectif de soutenir la régulation et la qualité de la collaboration (par des feedbacks ou interventions ciblées).

Ce plan suit une logique progressive (tester → générer → accompagner), en s'appuyant sur des cadres théoriques robustes que nous compléterons par d'autres approches évaluant la **qualité de la collaboration** et les **compétences psychosociales essentielles** (écoute active, résolution de conflits, reconnaissance des contributions, etc.).

Piste pour l'évaluation et le codage :

La qualité des processus de collaboration assistée par ordinateur (Meier et al., 2007)

Computer-Supported Collaborative Learning (2007) 2:63–86
DOI 10.1007/s11412-006-9005-x

A rating scheme for assessing the quality of computer-supported collaboration processes

Anne Meier · Hans Spada · Nikol Rummel

Received: 17 January 2006 / Revised: 28 August 2006 / Accepted: 19 December 2006 /
Published online: 7 February 2007
© International Society of the Learning Sciences, Inc.; Springer Science + Business Media, LLC 2007

Abstract The analysis of the process of collaboration is a central topic in current CSCL research. However, defining process characteristics relevant for collaboration quality and developing instruments capable of assessing these characteristics are no trivial tasks. In the assessment method presented in this paper, nine qualitatively defined dimensions of collaboration are rated quantitatively: sustaining mutual understanding, dialogue management, information pooling, reaching consensus, task division, time management, technical coordination, reciprocal interaction, and individual task orientation. The data basis for the development of these dimensions was taken from a study in which students of psychology and medicine collaborated on a complex patient case via a desktop-videoconferencing system. A qualitative content analysis was performed on a sample of transcribed collaboration dialogue. The insights from this analysis were then integrated with theoretical considerations about the roles of communication, joint information processing, coordination, interpersonal relationship, and motivation in the collaboration process. The resulting rating scheme was applied to process data from a new sample of 40 collaborating dyads. Based on positive findings on inter-rater reliability, consistency, and validity from this evaluation, we argue that the new method can be recommended for use in different areas of CSCL.

Keywords Assessment · Collaboration · Communication · Coordination · Group information processing · Interpersonal relationship · Motivation · Rating scheme · Videoconferencing

Les cinq aspects du processus collaboratif et les neuf dimensions qui en découlent pour le système de codage

Communication	Maintien de la compréhension mutuelle (<i>Sustaining mutual understanding</i>) → Capacité des membres à partager et clarifier leurs idées pour éviter les malentendus. Gestion du dialogue (<i>Dialogue management</i>) → Structuration des échanges pour assurer une communication efficace et fluide.
Gestion du dialogue	Mise en commun des informations (<i>Information pooling</i>) → Partage actif et équilibré des connaissances et des ressources entre les participants. Atteinte d'un consensus (<i>Reaching consensus</i>) → Processus de négociation et d'accord sur les décisions ou solutions communes.
Coordination	Répartition des tâches (<i>Task division</i>) → Distribution équitable et claire des rôles et responsabilités au sein du groupe. Gestion du temps (<i>Time management</i>) → Respect des échéances et optimisation du temps alloué aux différentes phases du projet. Coordination technique (<i>Technical coordination</i>) → Utilisation efficace des outils numériques pour soutenir la collaboration (ex. : plateformes, logiciels).
Relations interpersonnelles	Interaction réciproque (<i>Reciprocal interaction</i>) → Engagement actif de chaque membre dans les échanges et la coopération.
Motivation	Orientation individuelle vers la tâche (<i>Individual task orientation</i>) → Implication personnelle de chaque participant dans la réalisation des objectifs collectifs.

Piste pour l'évaluation et le codage : La collaboration interprofessionnelle en santé (Witti et al., 2003)

frontiers

Frontiers in Medicine

TYPE Hypothesis and Theory

PUBLISHED 02 October 2023

DOI 10.3389/fmed.2023.1213300

Check for updates

OPEN ACCESS

EDITED BY
Juliane E. Kämmer,
University of Bern, Switzerland

REVIEWED BY
Shaista S. Guraya,
Royal College of Surgeons in Ireland (Bahrain),
Bahrain
Reimer Riessen,
University of Tübingen, Germany

*CORRESPONDENCE
Jan M. Zottmann
✉ jan.zottmann@med.uni-muenchen.de

[†]These authors have contributed equally to this work

RECEIVED 19 May 2023

ACCEPTED 15 September 2023

PUBLISHED 02 October 2023

CITATION
Witti MJ, Zottmann JM, Wershofen B,
Thistlethwaite JE, Fischer F and
Fischer MR (2023) FINCA – a conceptual
framework to improve interprofessional
collaboration in health education and care.
Front. Med. 10:1213300.
doi: 10.3389/fmed.2023.1213300

COPYRIGHT
© 2023 Witt, Zottmann, Wershofen,
Thistlethwaite, Fischer and Fischer. This is an
open-access article distributed under the terms
of the [Creative Commons Attribution License \(CC BY\)](#). The use, distribution or reproduction
in other forums is permitted, provided the
original author(s) and the copyright owner(s)
are credited and that the original publication in
this journal is cited, in accordance with
accepted academic practice. No use,
distribution or reproduction is permitted which
does not comply with these terms.

FINCA – a conceptual framework to improve interprofessional collaboration in health education and care

Matthias J. Witt^{1†}, Jan M. Zottmann^{1†*}, Birgit Wershofen¹, Jill E. Thistlethwaite², Frank Fischer³ and Martin R. Fischer¹

¹Institute of Medical Education, LMU University Hospital, LMU Munich, Munich, Germany, ²Faculty of Health, University of Technology Sydney, Ultimo, NSW, Australia, ³Chair of Education and Educational Psychology, Department of Psychology, LMU Munich, Munich, Germany

The health care system in Germany and in many other countries is facing fundamental challenges due to demographic change, which require new integrated care concepts and a revision of the collaboration between health care professions in everyday clinical practice. Internationally, several competency framework models have been proposed, but a framework that explicitly conceptualizes collaborative activities to improve interprofessional problem-solving competency in health care is still missing. Such a framework should define contextual, person-related, process-related, and outcome-related variables relevant to interprofessional problem solving in health care. Against this background, we present a conceptual framework to improve interprofessional collaboration in health education and care (FINCA) developed with scientific consideration of empirical data and various theoretical references. FINCA reflects an interprofessional learning and interaction process involving two persons from different health care professions and with different individual learning prerequisites. These two initially identify a problem that is likely to require interprofessional collaboration at some point. FINCA acknowledges the context of interprofessional learning, teaching, and working as well as its action-modifying context factors. We follow the reasoning that individual learning prerequisites interact with the teaching context during learning activities. At the heart of FINCA are observable collaborative activities (information sharing and grounding; negotiating; regulating; executing interprofessional activities; maintaining communication) that can be used to assess individuals' cognitive and social skills. Eventually, the framework envisages an assessment of the outcomes of interprofessional education and collaboration. The proposed conceptual framework provides the basis for analysis and empirical testing of the components and variables it describes and their interactions across studies, educational interventions, and action-modifying contexts. FINCA further provides the basis for fostering the teaching and learning of interprofessional problem-solving skills in various health care settings. It can support faculty and curriculum developers to systematize the implementation and improvement of interprofessional teaching and learning opportunities. From a practical perspective, FINCA can help to better align curricula for different health professions in the future. In principle, we also see potential for transferability of the framework to other areas where different professions collaborate.

KEYWORDS
interprofessional education, interprofessional collaboration, collaborative problem-solving skills, observable collaborative activities, learning, teaching, scaffolding

Composantes structurelles de FINCA

```
graph LR
    subgraph Prerequisits
        direction TB
        P1[Individual learning prerequisites  
Person in profession A  
Cognitive professional abilities  
- Conceptual knowledge  
- Procedural knowledge  
- Collaborative knowledge  
Motivational and affective factors  
- Professional identity  
- Interest, engagement, attitude towards the subject matter]
        P2[Individual learning prerequisites  
Person in profession B  
Cognitive professional abilities  
- Conceptual knowledge  
- Procedural knowledge  
- Collaborative knowledge  
Motivational and affective factors  
- Professional identity  
- Interest, engagement, attitude towards the subject matter]
    end

    subgraph Teaching
        T[Teaching and scaffolding in IPE  
- Knowledge transfer  
- External collaboration scripts  
- Role-taking  
- Reflection phases]
    end

    Noticing[Noticing  
Interprofessional collaboration is identified as necessary (explicit or implicit)]

    subgraph Activities
        direction TB
        A1[Observable collaborative activities  
- Information sharing and grounding  
- Negotiating  
- Regulating  
- Executing interprofessional activities  
- Maintaining communication]
    end

    subgraph Context
        direction TB
        C1[Team factors (micro-level)  
- Team size and role clarity  
- Team composition, trust, experience  
- Leadership and hierarchies  
- Communication culture]
        C2[Organizational factors (meso-level)  
- Institutional and economic factors  
- Infrastructure and environment  
- Organizational culture]
        C3[System factors (macro-level)  
- Health care system and its regulations]
    end

    P1 --> Noticing
    P2 --> Noticing
    T --> Noticing
    Noticing --> A1
    Context --> A1
    A1 --> Results[Results of IPC  
- Accuracy (improved patient outcomes)  
- Improved patient experience  
- Improved clinical experience of the interprofessional team  
- Efficiency (reduced costs)]
    Results --> OutcomesA[Individual outcomes of IPE and IPC  
Person in profession A  
Improved cognitive professional abilities  
Improved collaborative activities]
    Results --> OutcomesB[Individual outcomes of IPE and IPC  
Person in profession B  
Improved cognitive professional abilities  
Improved collaborative activities]
```

1. Préréquis individuels d'apprentissage

Les professionnels impliqués (ex. : un médecin et une infirmière) apportent des **préréquis distincts** :

- **Compétences professionnelles cognitives**
- **Facteurs motivationnels et affectifs**

2. "Noticing" (Détection/Reconnaissance)

Processus psychologique déclenchant la collaboration interprofessionnelle

3. Activités collaboratives observables

Cœur du framework : **5 activités clés** pour évaluer les compétences cognitives et sociales :

- **Partage d'informations et ancrage** (*Information sharing and grounding*)
- **Négociation** (*Negotiating*)
- **Régulation** (*Regulating*)
- **Exécution d'activités interprofessionnelles** (*Executing interprofessional activities*)
- **Maintien de la communication** (*Maintaining communication*)

4. Soutien pédagogique (Scaffolding)

Mesures pour faciliter la collaboration :

- **Transferts de connaissances** : Utilisation de cas cliniques ou d'illustrations.
- **Scripts de collaboration externes** : Outils pour structurer les échanges.
- **Prise de rôle** (*Role-taking*) : Simulation de perspectives différentes
- **Phases de réflexion** (*Reflection phases*) : Pause pour évaluer les stratégies, générer des retours auto-dirigés, planifier les étapes suivantes.

5. Résultats (Outcomes)

FINCA envisage l'évaluation des **résultats** de l'IPE/IPP, notamment :

- Amélioration des **compétences individuelles** (cognitives, sociales).
- Impact sur la **qualité des soins**
- **Transférabilité** du cadre à d'autres domaines où plusieurs professions collaborent.

Witti, M. J., Zottmann, J. M., Wershofen, B., Thistlethwaite, J. E., Fischer, F., & Fischer, M. R. (2023). FINCA—a conceptual framework to improve interprofessional collaboration in health education and care. *Frontiers in medicine*, 10,

Piste pour l'évaluation et le codage : Les compétences psychosociales (Lamboy et al. , 2025)

MARS 2025

Les compétences
psychosociales : un
référentiel opérationnel à
destination des
professionnels experts et
formateurs CPS

• Tome I

Les compétences psychosociales

COGNITIVES

Renforcer
sa conscience
de soi

Accroître sa connaissance de soi
et savoir penser de façon critique
Connaître ses valeurs, besoins et buts
et prendre des décisions constructives
S'auto-évaluer positivement
Renforcer sa pleine attention

Renforcer
sa maîtrise de soi
et son
accomplissement

Atteindre ses buts personnels
Gérer ses impulsions
Résoudre des problèmes de façon créative
et efficace et savoir demander de l'aide

ÉMOTIONNELLES

Renforcer
sa conscience
des émotions

Comprendre les émotions
Identifier ses émotions

Réguler
ses émotions
et son stress

Exprimer ses émotions
de façon constructive
Réguler ses émotions agréables
et désagréables
Comprendre et gérer son stress

SOCIALES

Développer
des relations
constructives

Communiquer de façon efficace et positive
Communiquer de façon empathique
Développer des liens et des comportements prosociaux

Résoudre
des difficultés
relationnelles

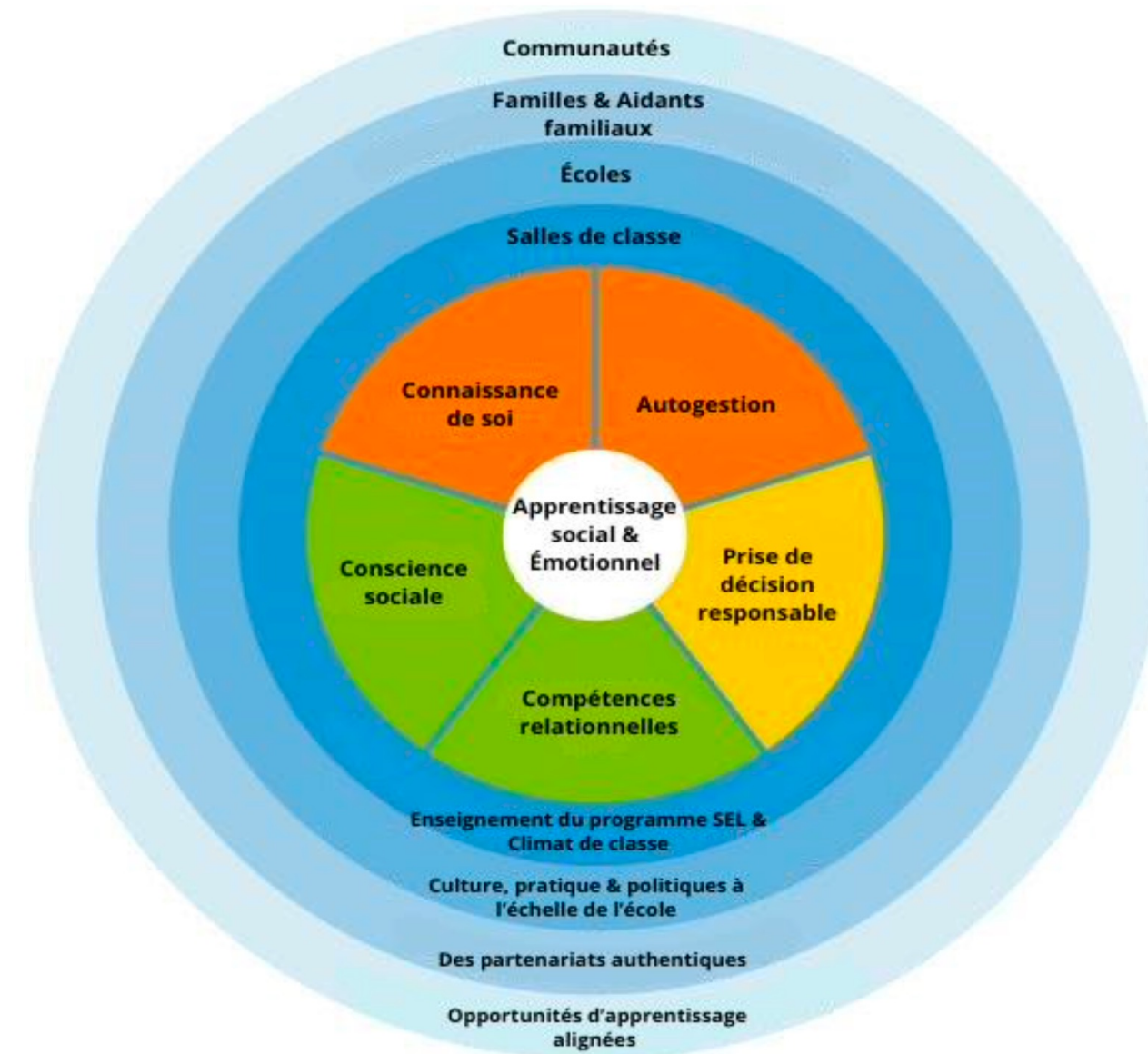
S'affirmer et résister à la pression sociale
par l'assertivité et le refus
Résoudre les conflits de façon constructive

Classification des Compétences Psychosociales

- **6 Compétences Psychosociales Générales**
- **20 Compétences Psychosociales Spécifiques** organisées en trois grandes catégories :
 - **Compétences Cognitives** (ex. : résolution de problèmes, prise de décision, pensée critique, créativité)
 - **Compétences Émotionnelles** (ex. : gestion du stress, reconnaissance des émotions, régulation émotionnelle)
 - **Compétences Sociales** (ex. : communication efficace, empathie, coopération, gestion des conflits)

Piste pour l'évaluation et le codage :
Les compétences socio-émotionnelle (CASEL, Mahoney et al., 2020)

Cinq compétences socio-émotionnelles de base
qui soutiennent l'apprentissage et le développement
selon le *Collaborative for Academic, Social, and Emotional Learning* (CASEL)



© 2020 American Psychological Association
ISSN: 0003-066X

American Psychologist

<http://dx.doi.org/10.1037/amp0000701>

Systemic Social and Emotional Learning: Promoting Educational Success for All Preschool to High School Students

Joseph L. Mahoney

University of Wisconsin-Superior and Collaborative
for Academic, Social, and Emotional Learning,
Chicago, Illinois

Roger P. Weissberg

Collaborative for Academic, Social, and Emotional Learning, Chicago,
Illinois, and University of Illinois at Chicago

Mark T. Greenberg

The Pennsylvania State University

Linda Dusenbury, Robert J. Jagers, Karen Niemi,
Melissa Schlinger, Justina Schlund,
Timothy P. Shriver, Karen VanAusdal, and
Nicholas Yoder

Collaborative for Academic, Social, and Emotional Learning, Chicago,
Illinois

Social and emotional learning (SEL) has become more central to education because of demand from educators, parents, students, and business leaders alongside rigorous research showing broad, positive impacts for students and adults. However, all approaches to SEL are not equal. Systemic SEL is an approach to create equitable learning conditions that actively involve all Pre-K to Grade 12 students in learning and practicing social, emotional, and academic competencies. These conditions require aligned policies, resources, and actions at state and district levels that encourage local schools and communities to build the personal and professional capacities of adults to: implement and continuously improve evidence-based programs and practices; create an inclusive culture that fosters caring relationships and youth voice, agency, and character; and support coordinated school-family-community partnerships to enhance student development. Promoting social and emotional competencies—including the abilities to understand and manage emotions, achieve positive goals, show caring and concern for others, establish and maintain positive relationships, and make responsible decisions—are important for success at school and in life. In this article, we summarize key concepts and evidence for systemic SEL. Next, we explain interrelated Theories of Action and resources developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL) to implement and continuously improve systemic SEL in schools, districts, and states. We discuss research on nested, interacting settings and processes involved in systemic SEL at proximal (classrooms, schools, families, and communities) and distal (districts, states, national, and international) ecological levels. We conclude with recommendations for future SEL research, practice, and policy.

Joseph L. Mahoney, Department of Human Behavior, Justice, and Diversity, University of Wisconsin-Superior, and Collaborative for Academic, Social, and Emotional Learning, Chicago, Illinois; Roger P. Weissberg, Collaborative for Academic, Social, and Emotional Learning, and Department of Psychology, University of Illinois at Chicago; Mark T. Greenberg, Department of Human Development and Family Studies, The Pennsylvania State University; Linda Dusenbury, Robert J. Jagers, Karen Niemi, Melissa Schlinger, Justina Schlund, Timothy P. Shriver, Karen VanAusdal, and Nicholas Yoder, Collaborative for Academic, Social, and Emotional Learning.

The authors appreciate the support of the following funders of the Collaborative for Academic, Social, and Emotional Learning (CASEL): Einhorn Family Charitable Trust, NoVo Foundation, Pure Edge Inc., Robert Wood Johnson Foundation, and Wallace Foundation. We also thank the following collaborators and thought partners for intellectual contributions:

tions to this article: Teresa Borowski, Suzanne M. Bouffard, Beth A. Herman, Adam Kernan-Schloss, and Kimberly Schonert-Reichl. All co-authors conceptualized the ideas in this article. Joseph L. Mahoney created the initial draft with input from Roger P. Weissberg, Mark T. Greenberg, Robert J. Jagers, Linda Dusenbury, and Nicholas Yoder. Roger P. Weissberg, Robert J. Jagers, Karen Niemi, and Melissa Schlinger acquired funding to support the research and preparation of this article and reviewed and edited drafts. Justina Schlund, Timothy P. Shriver, and Karen VanAusdal also reviewed and edited manuscript drafts.

Correspondence concerning this article should be addressed to Joseph L. Mahoney, Department of Human Behavior, Justice, and Diversity, University of Wisconsin-Superior, 3106 Swenson Hall, Belknap and Catlin Avenue, Superior, WI 54880, or to Roger P. Weissberg, Department of Psychology, University of Illinois at Chicago, 1007 West Harrison Street, 1009 BSB, Chicago, IL 60607. E-mail: jmahone4@uwsuperu.edu or rweissberg@casel.org

Mahoney, J. L., Weissberg, R. P., Greenberg, M. T., Dusenbury, L., Jagers, R. J., Niemi, K., Schlinger, M., Schlund, J., Shriver, T. P., VanAusdal, K., & Yoder, N. (2020).

Systemic Social and Emotional Learning: Promoting Educational Success for All Preschool to High School Students. *American Psychologist*. Advance online publication. <http://dx.doi.org/10.1037/amp0000701>

Génération automatique de dialogues collaboratifs interprofessionnels en santé : I^{er} test

Une IA Générative (IAGen) peut-elle produire et étiqueter un dialogue collaboratif fictif entre 2 intervenants selon les modèles FINCA (Witti *et al.*, 2003), CPS (Lamboy *et al.* 2025) et CASEL (Mahoney *et al.*, 2020) ?

1. Elaborer une grille d'analyse des interactions générique originale (basée sur FINCA + CPS + CASEL) qui conserve la logique de FINCA (prérequis → noticing → activités → facteurs → résultats), mais reformulée en vue d'être applicable à toute situation de collaboration interprofessionnelle en santé dans un premier temps puis applicable à d'autres domaines.
2. Générer un dialogue collaboratif fictif entre un oncologue et une infirmière qui doit mettre en œuvre un protocole de soins palliatifs. Le dialogue doit comporter des segments de collaboration intégrant les compétences psychosociales (CPS), socio-émotionnelle (CASEL) ainsi que les compétences cognitives et sociales (FINCA).
3. Etiqueter les segments de la conversation collaborative selon la typologie construite via la grille d'analyse pour comparer les résultats proposés par l'IAG et ceux d'experts.

Lamboy, B., Jeannel, D., Mouraire, E., Simar, C., Shankland, R., Rose, L., Gauchet, A., Carré, A., Favre, D., Guéguen, C., & Fréry, N. (2025).

Les compétences psychosociales: un référentiel opérationnel à destination des professionnels experts et formateurs CPS. *Santé publique France*, 20.

Mahoney, J. L., Weissberg, R. P., Greenberg, M. T., Dusenbury, L., Jagers, R. J., Niemi, K., Schlinger, M., Schlund, J., Shriver, T. P., VanAusdal, K., & Yoder, N. (2020).

Systemic Social and Emotional Learning: Promoting Educational Success for All Preschool to High School Students. *American Psychologist*. Advance online publication. <http://dx.doi.org/10.1037/amp0000701>

Witti, M. J., Zottmann, J. M., Wershofen, B., Thistlethwaite, J. E., Fischer, F., & Fischer, M. R. (2023). FINCA—a conceptual framework to improve interprofessional collaboration in health education and care. *Frontiers in medicine*, 10,

Test avec GPT

Après lui avoir chargé le PDF de l'article FINCA (Witti *et al.*, 2003) :

1. Faire une synthèse de l'article
2. Enrichir le framework FINCA avec celui des compétences psycho-sociales (CPS, Lamboy *et al.*, 2025) et socio-émotionnelle (CASEL, Mahoney *et al.*, 2020), via l'élaboration d'une grille d'analyse originale
3. Standardiser la grille afin de pouvoir l'appliquer à d'autres domaines (éducation, travail social, management, ingénierie...)

Lamboy, B., Jeannel, D., Mouraire, E., Simar, C., Shankland, R., Rose, L., Gauchet, A., Carré, A., Favre, D., Guéguen, C., & Fréry, N. (2025).

Les compétences psychosociales: un référentiel opérationnel à destination des professionnels experts et formateurs CPS. *Santé publique France*, 20.

Mahoney, J. L., Weissberg, R. P., Greenberg, M. T., Dusenbury, L., Jagers, R. J., Niemi, K., Schlinger, M., Schlund, J., Shriver, T. P., VanAusdal, K., & Yoder, N. (2020).

Systemic Social and Emotional Learning: Promoting Educational Success for All Preschool to High School Students. *American Psychologist*. Advance online publication. <http://dx.doi.org/10.1037/amp0000701>

Witti, M. J., Zottmann, J. M., Wershofen, B., Thistlethwaite, J. E., Fischer, F., & Fischer, M. R. (2023). FINCA—a conceptual framework to improve interprofessional collaboration in health education and care. *Frontiers in medicine*, 10,

Une grille d'analyse des interactions génériques (basée sur FINCA + CPS + CASEL)

Catégorie FINCA	Comportements observables	Compétences psycho-sociales mobilisées	Indicateurs d'évaluation
Prérequis individuels	Mobilisation des savoirs, motivation, identité professionnelle	Communication, empathie, régulation émotionnelle	Capacité à mobiliser connaissances/attitudes adaptées
Noticing (prise de conscience)	Reconnaissance d'un besoin de collaboration	Conscience de soi et des autres, sensibilité culturelle	Identification explicite d'un besoin de collaboration
Activités collaboratives - Partage d'information	Transmission claire, vérification de compréhension	Écoute active, reconnaissance des apports, validation des émotions	Clarté des échanges, vérification mutuelle de compréhension
Activités collaboratives - Négociation	Échange d'arguments, recherche de compromis	Diplomatie, assertivité, gestion constructive des désaccords	Présence de compromis, ajustement argumenté
Activités collaboratives - Régulation	Fixation et suivi d'objectifs communs	Leadership partagé, soutien mutuel, gestion de groupe	Objectifs partagés, ajustements collectifs
Activités collaboratives - Exécution	Mise en œuvre conjointe des décisions	Coopération, flexibilité, solidarité	Réalisation effective des tâches conjointes
Activités collaboratives - Communication	Maintien d'un climat relationnel respectueux et productif	Feedback constructif, reconnaissance, prévention des malentendus	Respect mutuel, continuité du dialogue
Facteurs contextuels	Influence des dynamiques d'équipe, organisation, système	Confiance, sécurité psychologique, gestion des contraintes	Impact des contextes micro, méso, macro sur l'interaction
Résultats attendus	Qualité du résultat, bien-être, apprentissages, durabilité	Satisfaction, cohésion, prévention des conflits	Performance collective, bien-être, apprentissage durable

Produire et étiqueter un dialogue collaboratif fictif (intégration FINCA + CPS + CASEL)

Générer un dialogue collaboratif fictif entre un oncologue et une infirmière qui doit mettre en œuvre un protocole de soins palliatifs.

Le dialogue doit comporter des segments de collaboration élaborés et étiquetés selon la typologie construite

via la grille d'analyse intégrant les compétences psychosociales (CPS), socio-émotionnelle (CASEL) ainsi que les compétences cognitives et sociales (FINCA).

 **Infirmière (Nadia) :**

(Noticing – CPS : empathie, conscience de l’autre)

« Docteur, je voulais discuter du patient M. Dupont. Il a exprimé ce matin une grande douleur malgré les antalgiques, et il semble aussi très anxieux. Je pense que nous devons réévaluer son plan de soins. »

 **Oncologue (Dr. Martin) :**

(Partage d’information – Cognitif)

« Merci de l’avoir remarqué, Nadia. De mon côté, les derniers examens montrent une progression de la maladie. Le pronostic est désormais limité à quelques semaines. »

 **Nadia :**

(Partage d’information & Grounding – CPS : écoute active)

« Donc, si je comprends bien, la maladie ne répond plus au traitement, et il faut envisager un passage complet en soins palliatifs ? »

 **Dr. Martin :**

(Grounding – Cognitif + Communication claire)

« Exactement. L’objectif doit désormais être le confort et la qualité de vie. »

 **Nadia :**

(Négociation – CPS : assertivité bienveillante)

« Je propose d’ajuster la morphine en perfusion continue, car les bolus actuels ne suffisent plus. Mais je crains les effets secondaires sur la vigilance. Qu’en pensez-vous ? »

 **Dr. Martin :**

(Négociation – Cognitif + Régulation)

« C’est un bon point. Nous pourrions débiter à faible débit, puis titrer progressivement. En parallèle, je suggère d’impliquer la psychologue pour accompagner son anxiété. »

 **Nadia :**

(Régulation – CPS : leadership partagé)

« D’accord, donc notre plan serait : ajustement morphine en perfusion continue, suivi des effets secondaires, et soutien psychologique. Je peux informer la famille et coordonner avec la psychologue. »

 **Dr. Martin :**

(Maintien de la communication – CPS : reconnaissance, feedback positif)

« Parfait. Merci de prendre cette initiative, votre lien avec la famille est précieux. »

 **Nadia :**

(Exécution des activités collaboratives – CPS : coopération)

« Je vais préparer la prescription avec vous, vérifier le matériel et informer l’équipe de nuit pour assurer la continuité. »

 **Dr. Martin :**

(Exécution – Cognitif + Communication)

« Très bien. Je signe la prescription et reste disponible si une adaptation rapide est nécessaire. »

 **Nadia :**

(Maintien de la communication – CPS : soutien émotionnel)

« Merci docteur. Je pense que cela rassurera aussi beaucoup la famille. Je passerai les voir pour expliquer calmement la démarche. »

 **Dr. Martin :**

(Régulation & Communication – CPS : empathie, sensibilité culturelle)

« N’hésitez pas à me solliciter si la famille a besoin d’explications médicales supplémentaires. C’est important qu’ils se sentent accompagnés. »

Cadre théorique	Problématique	Méthodologie	Résultats	Conclusion	Perspectives
Avantages de l'intégration FINCA + CPS + CASEL (selon Claude) • Pour la recherche : – Granularité accrue : les CPS permettent d'analyser plus finement les mécanismes de la collaboration – Mesurabilité : instruments validés existants pour évaluer les CPS – Prédicativité : les CPS individuelles prédisent la qualité de la collaboration • Pour la formation : – Ciblage précis : identifier les CPS à développer pour améliorer la collaboration – Progressivité : développer les CPS dès la formation initiale – Transfert : les CPS sont transférables à d'autres contextes • Pour la pratique : – Prévention du burnout : les CPS émotionnelles protègent les soignants – Climat d'équipe : les CPS sociales améliorent la cohésion – Performance : équipes avec CPS élevées = meilleurs résultats patients • Pour les individus : – Bien-être : développement personnel au-delà du professionnel – Adaptabilité : meilleure gestion du changement et de l'incertitude – Leadership : préparation aux rôles de coordination			Limites et précautions (selon Claude) • Complexité : le framework enrichi est plus complexe à opérationnaliser • Temporalité : les CPS se développent lentement, nécessitent investissement long terme • Individualisation : attention à ne pas surmédicaliser les difficultés relationnelles normales • Équilibre : maintenir le focus sur les objectifs de soin, pas uniquement sur les processus • Validation : nécessité de tests empiriques rigoureux avant généralisation Conclusion (selon Claude) L'intégration des compétences psychosociales (CASEL et CPS) dans le framework FINCA enrichit substantiellement notre compréhension de la collaboration interprofessionnelle en santé. Les CPS constituent les fondations intrapersonnelles et interpersonnelles qui permettent l'expression des activités collaboratives observables. Cette intégration offre : – Une vision plus complète de ce qui permet une collaboration efficace – Des leviers d'action plus nombreux pour la formation et l'amélioration continue – Un langage commun entre éducation, psychologie et sciences de la santé – Une perspective développementale reconnaissant que devenir un bon collaborateur est un processus long – Ce framework intégré FINCA-CPS représente une synthèse théorique qui demande maintenant à être testée empiriquement dans divers contextes de soins et de formation interprofessionnels.		

3 questions vives (en guise de conclusion provisoire) :

- 1) Quels modèles explicites, systématiques et réfutables mettre en œuvre (ou concevoir) pour promouvoir le développement de systèmes d'intelligence artificielle pour l'apprentissage humain (SIAAH) explicables, concernant notamment la rédactique (*Prompt engineering*), la génération augmentée de récupération (*Retrieval augmented generation* (RAG)), l'ajustement (*Fine-tuning*)... ?
- 2) Comment analyser la manière dont les groupes d'apprenant•e•s mobilisent et intègrent les productions de systèmes d'IA générative dans leurs interactions, au sein de processus situés de co-construction de sens ?
- 3) Dans quelle mesure les logiques de conception d'outils pour soutenir la collaboration peuvent-elles s'appliquer à la conception de systèmes d'IA générative appelés à intervenir comme co-participants dans la co-construction émergente de sens ?

Prolonger le rêve de Doug Engelbart : soutenir la résolution collective de problèmes complexes

We have a dream...

La génération augmentée de récupération (*retrieval-augmented generation*) permettra notamment à DOUG de générer des réponses adaptées à un contexte professionnel précis tout en permettant l'appropriation collective des connaissances, savoirs, expertises de chacun des membres du groupe.

DOUG sera conçu en prenant appui sur les outils de mirroring et de guidage (*awareness* de groupe) : apporter aux équipes des informations sur leur activité de raisonnement clinique collaboratif et des recommandations quant à la façon de la réguler.

DOUG sera alors à la fois :

- le témoin intelligent (visualisation de l'activité, monitoring des interactions),
- le facilitateur dialogique (coordination, régulation du discours)
- le médiateur réflexif (mémoire collective, construction d'un langage et d'une représentation commune).

Il pourra faire des recommandations autant sur la dimension cognitive (raisonnement clinique) que sur la dimension relationnelle (régulation des interactions socio-émotionnelles) ou métacognitive (RCP).

Références bibliographiques

- Bittencourt, I. I., Chalco, G., Santos, J., Fernandes, S., Silva, J., Batista, N., Hutz, C., & Isotani, S. (2024). Positive Artificial Intelligence in Education (P-AIED): A roadmap. *International Journal of Artificial Intelligence in Education*, 34(3), 732–792.
- Bush, V. (1945). *As We May Think*, Atlantic Monthly.
- Cruz-Panesso, I., Brien, L.-A., & Drolet, P. (2024). *Les fenêtres interprofessionnelles : un modèle visant l'apprentissage de la confiance et de l'empathie interprofessionnelles par la simulation*, Congrès international francophone de pédagogie des sciences de la santé, Marrakech 5-7 juin 2024.
- Engelbart, D. C. (1963). A conceptual framework for the augmentation of man's intellect. *Vistas in information handling*, 1, 1-29.
- Engelbart, D. (1968). *A Research Center for Augmenting Human Intellect*. Association for Computing Machinery / Institute of Electrical and Electronics Engineers (ACM/IEEE) San Francisco (CA).
- Heutte, J., Fenouillet, F., Martin-Krumm, C., Gute, G., Raes, A., Bachelet, R. , & Csikszentmihalyi, M. (2021). Optimal Experience in Adult Learning: Conception and Validation of the Flow in Education Scale (EduFlow-2). *Frontiers in Psychology, section Educational Psychology*, 12, 1-12. doi: 10.3389/fpsyg.2021.828027
- Järvelä, S., Zhao, G., Nguyen, A., & Chen, H. (2025). Hybrid intelligence: Human–AI coevolution and learning. *British Journal of Educational Technology*, 56(2).
- Levy, P. (2003). Le jeu de l'intelligence collective, *Sociétés* 1(79).
- Lamboy, B., Jeannel, D., Mouraire, E., Simar, C., Shankland, R., Rose, L., Gauchet, A., Carré, A., Favre, D., Guéguen, C., & Fréry, N. (2025). Les compétences psychosociales: un référentiel opérationnel à destination des professionnels experts et formateurs CPS. *Santé publique France*, 20.
- Mahoney, J. L., Weissberg, R. P., Greenberg, M. T., Dusenbury, L., Jagers, R. J., Niemi, K., Schlinger, M., Schlund, J., Shriver, T. P., VanAusdal, K., & Yoder, N. (2020). Systemic Social and Emotional Learning: Promoting Educational Success for All Preschool to High School Students. *American Psychologist*. Advance online publication. <http://dx.doi.org/10.1037/amp0000701>
- McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (1955). *A proposal for the Dartmouth summer research project on artificial intelligence*,
- Meier, A., Spada, H. & Rummel, N. (2007) A rating scheme for assessing the quality of computer-supported collaboration processes. *Computer Supported Learning* 2, 63–86.
- Minsky, M. (1968). Preface. In M. Minsky (Ed.), *Semantic information processing*. The MIT Press.
- Nguyen, A., Ilesanmi, F., Dang, B., Vuorenmaa, E., & Järvelä, S. (2024). Hybrid Intelligence in Academic Writing: Examining Self-Regulated Learning Patterns in an AI-Assisted Writing Task. In *HHAI 2024: Hybrid Human AI Systems for the Social Good* (pp. 241-254). IOS Press
- Molinari, G., Avry, S., & Chanel, G. (2017). Les émotions dans les situations de collaboration et d'apprentissage collaboratif médiatisées par ordinateur. *Raisons éducatives*, 21(1), 175-190.
- Otlet, P. (1934). *Traité de documentation*. Edition Mundaneum.
- Sanchez, E., Bonnat, C., Bonvin, G., Jaouadi, M., Morard, S., Parmentier, H., Plumettaz-Sieber, Prior, E., Paukovics, E., & Senecail, A. (2026). *Recherche orientée par la conception en éducation : Modèles, méthodes, outils*. ISTE Group.
- Witti, M. J., Zottmann, J. M., Wershofen, B., Thistlethwaite, J. E., Fischer, F., & Fischer, M. R. (2023). FINCA—a conceptual framework to improve interprofessional collaboration in health education and care. *Frontiers in medicine*, 10,