

Creating a Tool to Support Perseverance Among Post Secondary Students with Learning Difficulties

Louise Sauvé, Nicole Racette, Godelieve Debeurme, François Ruph, Marie-Michèle Roy, Denise Berthiaume, W. Alan Wright, Philippe Labelle and Karol Pépin

Abstract - In Quebec, furthering your education is very much encouraged and we have observed that more and more people with learning difficulties are enrolling in postsecondary education. However, institutions lack the necessary resources to support this emerging clientele. In this context our developmental research was initiated to create an online support database for persistence in postsecondary education. Here we present the *Système d'Aide Multimédia Interactif à la PERSÉVÉRANCE pour les étudiants ayant des Troubles d'Apprentissage (SAMI-Persévérance TA) (Interactive Multimedia Support System for Persistence for Students with Learning Difficulties)* developed through this research as well as the results obtained from a trial with 181 students at the postsecondary level. Results revealed that students consider these tracking tools and support tools are pertinent, motivating and useful for resolving certain difficulties that they face during their studies, in terms of learning strategies and weaknesses in oral, written and mathematical skills.

Index Terms - Perseverance and persistence, postsecondary students, learning difficulties, support tool, learning strategies.

I. INTRODUCTION

In order to stimulate persistence and academic success, postsecondary institutions provide resources for students who are struggling. These available resources vary from one institution to the next and from one time frame to the next. Furthermore, these resources are focused on developing interventions oriented towards integrating and adapting the student to the system (Tinto model) rather than to the needs of each individual student. However, to us it seems that it would be important to equip students to overcome their difficulties. The SAMI-Persévérance (<http://perseverance.savie.ca>) database that has been compiled over the past few years by our research team attempts to do just this and to respond to the needs of each student. However, this database did not take into account students with learning disabilities who wish to obtain a postsecondary level diploma. It is in this context that developmental research, financed by the *Programme de recherche sur la persévérance et la réussite scolaires du ministère de l'Éducation, du Loisir et du Sport et du Fonds Québécois de la Recherche sur la Société et la Culture*, adopted the goal of identifying the needs of students with one or more learning disabilities linked to learning strategies at the oral, written or mathematical level and to examine how the help tools that are online in the SAMI-Persévérance TA database can help students to progress during their first year of studies at the postsecondary level.

Despite the fact that technological means are available to students and that certain studies provided insight into the contributions of support technology for learning disabilities, very few studies have been conducted to examine the

contributions of online support databases that are complete and adapted to the particular needs of this clientele with the goal of supporting them throughout their studies.

We will first describe the context in which the SAMI-Persévérance TA tool was developed. Then we will describe the database in terms of objectives that are: (1) identify, with the help of tracking tools, the learning strategy improvement needs of learning disabled students, their oral competencies, as well as their written and mathematical skills, (2) offer timely on-line support to help students mitigate the negative effects of difficulties faced throughout their academic careers. These tools, rich in both multimedia and interactivity, were developed as learning objects that are reusable on multiple platforms. Finally, we will briefly explain the methodology used and the preliminary results obtained according to validation of this database in terms of ergonomics and the pertinence according to the target audience.

II. THE DEVELOPMENTAL CONTEXT OF SAMI-PERSÉVÉRANCE TA

Given that « le rehaussement de la scolarisation de la population est un défi incontournable dans une société ouverte sur le monde, qui mise sur le savoir, la créativité et l'innovation » (CSÉ^[1], 2008, p.7), access to and success in postsecondary education become major factors that allow the development of an individual's full potential. To attain this worthy objective of improving education levels in the knowledge society, we must find solutions to counter dropout. According to UNETP^[2] (2010), dropping out of education is a gradual process of disengagement that can be reversed through enriched learning experiences and satisfying interactions with the educational institution. In order to help students better adapt to their circumstances and to allow them to obtain their diploma, it is essential that postsecondary institutions provide students with difficulties the support programs designed to meet their needs throughout their studies (Wright et al ^[3], 2008; Parkin and Baldwin^[4], 2009). These measures must be holistic in their approach and comprise of « des dispositifs d'accompagnement personnalisés mais suppose également des transformations en termes d'offre de formation, d'organisation pédagogique et de pédagogie » (Endrizzi^[5], 2010, p. 1). What do we know about support tools available to students at the postsecondary level who have learning difficulties? Lemire Auclair^[6] (2006) groups these help measures into two categories:

- Reeducation. The aim is to improve abilities and to adopt effective compensation strategies. Ruban et al^[7] (2003) as well as Dubé and Sénécal^[8] (2009) conclude that the development of compensational learning strategies

(cognitive and self-regulation) contribute significantly to augmenting academic success of the population studied. Heiman and Prece^[9] (2003) invite universities to take advantage of research on identifying specific difficulties in each field of study and in strategies likely to support student progress.

- Accommodation measures that make services, technological or logistical help tools available to learners. Sharpe et al. ^[10] (2005) list, by order of importance, the following educational services: granting additional time, a quiet environment, communication with the teacher, assistance from a tutor or another type of assistant, recordings of texts to be read, recordings of the professor's lecture, a note-taker, an adequate location for listening and reading a task out loud. Support technologies most used are numerizers, talking books, digital and portable note-taking devices, reading help software, specialized recording devices, voice recognition software, an advanced mouse system, adapted workstations, and word prediction software (Ofiesh and Hughes^[11], 2002; Sharpe et al ^[10], 2005; Statistics Canada^[12], 2009; King, Barile et al^[13], 2010). Statistics Canada^[12] (2009) highlights the fact that 31.6% of ETAs confirm that they need these types of measures. But what does research say about the effectiveness of these measures?

For many years now, learning difficulties have been studied in the United States and English-speaking Canada (Corbeil^[14], 2008), yet many authors deplore how little empirical research has been conducted in the francophone world, particularly concerning students at the postsecondary level who have learning difficulties (Gregg^[15], 2007; Ofiesh^[16], 2007; Dubé and Sénécal^[8], 2009). Fichten et al^[17] (2006) states that to provide proper intervention, it is imperative to know the principle obstacles and facilitators related to postsecondary success of students with learning disabilities. Too often these students are « accusés d'être paresseux, de ne pas vouloir collaborer et de ne pas être intéressés à leurs études alors que la vraie déficience est l'absence de méthodes adéquates d'enseignement et de soutien qui peuvent contourner les handicaps. » (Conseil du Premier Ministre sur la condition des personnes handicapées^[18], 2007, p.7). They are mistakenly considered lazy and lacking in collaboration. According to ACTA^[19] (2010), in order to reduce to a minimal level the workload and cost to Canadian society, it is necessary to carry out an early tracking of these troubles and to intervene to support students.

As Walcot-Gayda^[20] (2004) highlights that tracking learning difficulties is complex because, for the majority of individuals concerned, the symptoms associated with these difficulties only appear periodically. Furthermore, the symptoms described should not be attributed wrongly to learning difficulties as may happen in certain cases for intellectual deficiencies or mental health problems. For this reason, a diagnosis must be made by a health professional: a psychologist, a medical doctor, a neuropsychologist, or other (Office des professions du Québec^[21], 2005).

Professionals encourage tracking activities, whether conducted by specialists or not, in order to incite people with difficulties to recognize their situation and to further

consult a specialist (Office des professions du Québec, 2005). The current structure makes it very difficult to conduct tracking activities with learning difficulties (CRÉPUQ^[22], 2010). According to CRÉPUQ^[22] (2010), the lack of early tracking is due partly to the lack of human resources dedicated to this work, and this results in a considerable limitation for the target population's integration and success in postsecondary education. Given the increase in this clientele in the postsecondary sector, it is important to offer tools that favor success and program completion. Covington^[23] (2004) states that we have to develop a large inventory of methods and help tools, flexible in their use to support persistence for students with learning difficulties.

Until now, studies on available tools in the postsecondary milieu for students with difficulties have mostly focused on describing the nature of the programs and services offered rather than verifying the effectiveness of what is offered (Ofiesh^[16], 2007). Dubé and Sénécal^[8] (2009) determine that it is necessary to improve the organization of the support services available to postsecondary students with learning difficulties in order to better respond to their needs. But to improve these services in an efficient manner, the services must first be evaluated. There are very few studies on this topic. Lemire Auclair^[6] (2006) also questions the adequacy of the means available to students with learning difficulties according to their needs.

Troiano et al^[24] (2010) conclude that the students who turned to help centre services in educational institutions obtained better results and a higher graduation rate than those who did not use these support tools. Ofiesh et al^[11] (2002) as well as Sharpe et al^[10] (2005) demonstrated that these services and the assisting technology prove to be effective because they facilitate comprehension and the treatment of written and oral learning content. Once students receive the necessary help measures during their first session of postsecondary studies, they obtain the same results in exams as students who do not have learning difficulties (King, Barile et al^[13], 2010) and their rate of graduation is equivalent to that of students without learning difficulties (King^[25], 2010). Furthermore, we note that two out of three people who have a learning disability (63.7%) consider that the use of the Internet improves their quality of life (Statistics Canada^[12], 2009). Therefore, technological tools first strive to respond to the abilities of the user rather than the user's handicap. Using these tools allows users to boost their self-confidence as well as their autonomy. In this way they mitigate the difficulties they face, produce better quality assignments and study more effectively (King^[25], 2010).

Students who turn to support technologies during their studies can face problems such as the high cost of support technology, the lack of technology usage training, technical issues, and extra time and effort using these technologies can sometimes require (King, Nguyen and Chauvin^[26], 2010). What is more, personnel at educational institutions sometimes think that the accommodations made available to students provide them with a privilege that creates an injustice towards students who do not have access to these

resources. This type of thinking leads to students with learning difficulties feeling marginalized (King, 2010).

With the goal of supporting student success, many researchers (Fichten et al^[17], 2006; Colorado and Howell^[27], 2010; Karabenick^[28], 2011; King, Nguyen and Chauvin^[26], 2010; Sharabi and Margalit^[29], 2010; UNETP^[2], 2010) focused on the uses of tools available online to mitigate inherent difficulties faced by students with learning difficulties. This despite the fact that in certain cases the use of online tools can accentuate feelings of isolation (Sharabi and Margalit^[29], 2010), regardless of how beneficial these Web resources are to students in the target population. Available from anywhere, online tools, especially technological support tools, provide a flexibility of use (Keefer and Karabenick^[30], 1998; King^[25], 2010). They also offer ETAs positive learning experiences and interactions (two important factors in academic perseverance according to UNETP^[2], 2010) by providing immediate feedback and by guiding them towards resources (online or not) adapted to their specific needs (UNETP^[2], 2010).

III. THE SUPPORT TOOL SAMI-PERSÉVÉRANCE TA

In order to respond to the needs of students with learning difficulties, we developed an online help tool to support perseverance in postsecondary studies, a system that provides tracking help tools designed to mitigate difficulties faced by this clientele in terms of learning strategies and deficiencies in oral, written and mathematical skills.

S@MI-Persévérance TA (<http://taperseverance.savie.ca>) is an Interactive Multimedia Help System for PERSEVERANCE in postsecondary studies offered online for students with Learning Disabilities (Figure 1).

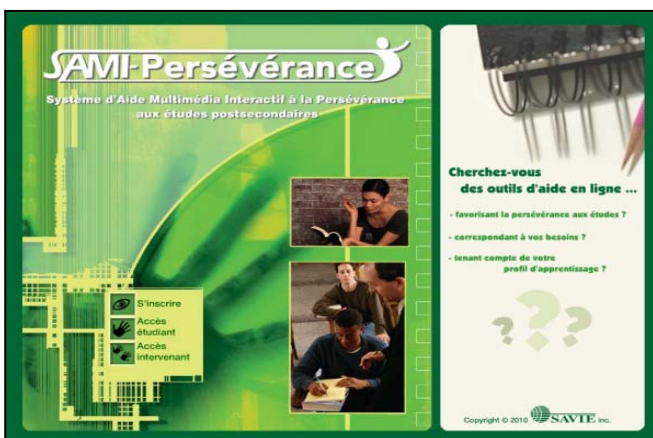


Figure 1. Home page: SAMI-Persévérance TA

In the home page, three menus are available.

- The menu *Sign Up* accesses a sign up form that must be completed before accessing the interactive multimedia help system for perseverance in studies. It collects personal information for each student. The form is divided into six sections: (1) sociodemographic information: gender, age group, marital status, (2) place of

residence during studies, (3) the current academic situation (type and mode of studies) and any previous training before entering university (last diploma obtained); (4) work during studies and the type of planned financing; (5) the diagnostic (known or unknown) in terms of learning disabilities and (6) a personal description of the student. During sign up, the student must also confirm his/her consent to participate in the research by checking a box for this, authorizing the research personnel to use this information during the experimental process as well as any information collected about his/her educational institution.

- The menu *Student Access* constitutes the core of SAMI-Persévérance. This environment offers a realm for self-guided learning, self-reflection and self-evaluation that allows a personalization of learning since it is rooted in analysis of difficulties faced by each individual in order to offer adapted help tools.

- The *Resource Person Access* provides teachers and tutors with the same content a student can access and additionally; (1) follow-up tools: access to each student's portfolio and to the educational institutions statistics (synthesis of archives collected by the system) and (2) synchronous mode communication tools (videoconferencing and asynchronous (discussion forum, email) allowing discussions and support between users.

In the 2nd menu (Student Access, Figure 2), we find: Welcome, Succeeding in my Studies, Work Tools, Portfolio, and Logout. Since we are seeking to help students who are experiencing difficulties, in this article we are present only three aspects of this environment: in the section *Succeeding in my Studies*, we present the learning strategies and learning disabilities, then we present the section titled *Portfolio*.

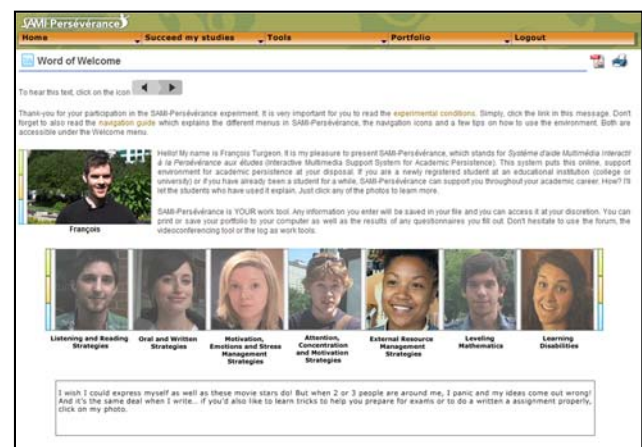


Figure 2. Menus in the Student Access section

A. Learning Strategies

To present the help tools in the learning strategies, we based ourselves on the 5 learning strategies as defined by Ruph^[31] (2010):

- Listening and reading strategies aim to appropriate the information that is pertinent to learning, including cognitive operations such as comprehension, representation and the retention of information in order to use it in the future. They find their application during authoritative

reviews in class or at a distance (audio/videoconference), in a reading context, during documentation research, in problem solving context, case studies, observation, comprehension of diverse instructions, etc. Deficiencies observed in this category are manifest in difficulties based on comprehension and organization of course material, most notably the difficulties in selecting that which is important, summarizing or synthesizing, organizing knowledge hierarchically and establishing links with reality.

- Strategies for oral and written production refer to cognitive strategies prompting the use of acquired knowledge. These are applied during written or oral exams, presentations, written assignments, teamwork, problem solving, internships, etc. Deficiencies in this category are manifest through difficulties in communicating ideas, being understood, choosing what is appropriate to say and what isn't, organizing communication (repetition, omission, lack of structure), forgetting a part of instructions or a given problem, providing "irrelevant" answers and making "careless" mistakes.

- Management strategies for external resources focus on planning, organization, and effective use of available resources favoring learning. This involves time, work tools, tutors, teachers, specialized help services, digital information, etc. Deficiencies in this category are manifest through problems in organizing, planning, managing time and the study environment, resulting in procrastination, keeping on schedule, feeling that there is not enough time, end of semester cramming, finding course materials, forgetfulness (work, exam dates, appointments).

- Strategies for attention management, concentration and memorization require mental capacities to remain attentive and to concentrate on a task related to learning. Deficiencies in this category are manifest by slowness engaging in a task, distractions in the environment (sounds, images), personal preoccupation, lack of concentration during class, a reading or an assignment. These strategies also involve issues around planning and management of memorization efforts for long term, gaps in memory, problems retaining learning, evaporation of knowledge after exams, quickly forgetting what has been read.

- Strategies for motivation management, stress management and management of emotions linked to impulsive behavior and stress management. Deficiencies that are associated manifest themselves through feelings of disorientation, vague goals, absence of vocation, the feeling of wasting time, lack of perseverance, negligence, uncaring attitude, difficulty getting to work, procrastination and not prioritizing studies. Problems linked to stress are manifest through anxiety about exams, freezing up when faced with challenges, stress due to assignments, being shy about public speaking, fear of presentations, and feelings of being overwhelmed. Problems related to emotions are manifest by problems linked to feelings of competency: lack of self-confidence, uncertainty in relation to academic success, defeatist thoughts, feelings of culpability related to difficulties and failures, self-criticism and feelings of inferiority compared to other students. Finally, problems linked to impulsive behavior basically amounts to

answering too quickly and acting without thinking about the consequences.

For each learning strategies category, we propose to students with learning difficulties three ways to access help tools that are likely to help mitigate difficulties they face: searching the tools by key words, searching by using a conceptual chart (Figure 3) or the complete list allowing them to search specifically according to their needs.

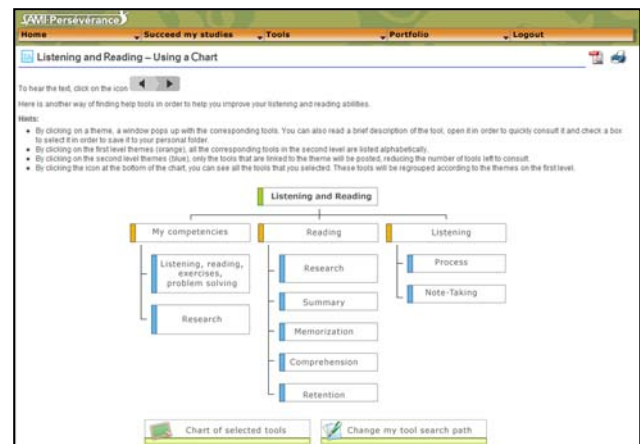


Figure 3. Searching for tools using a conceptual chart

The help tools available are rich in multimedia and are interactive. These are learning objects that can be reused on different platforms. Each is chosen according to the needs of individual students and provides a personalized learning experience.

B. Learning disabilities

The learning disabilities that are taken into account in this research were defined by scientific research and by the frequency of cases occurring in the postsecondary milieu. We have identified dyslexia, dysorthographia, dyscalculia and attention deficit disorder with or without hyperactivity. Linking to these disabilities, three tracking tools were developed and are now available to students. By tracking tools, we mean a way to identify whether symptoms associated with a learning disabilities are present or not. According to the Office of Professions of Quebec^[21] (2005), although tracking can be done by parents, friends, teachers or professionals, the diagnosis is exclusively the domain of health specialists (psychologists, neuropsychologists, or doctors according to the disability). The tracking tool is defined by "examining an individual situation or a collective psychological, social or pedagogical order judged to be complex or critical, performed with the goal of specifying the determining factors and to instill the appropriate corrections" (OQLF^[32], 2010). In the database, the tracking tools are present in the form of a questionnaire. For example the Questionnaire on written language disabilities (Mimouni et al^[33], 2010) proposes that the student first complete a preliminary section of the questionnaire. According to the results obtained in this section, two options are offered: (1) follow the tracking deeper into the particular learning disabilities by using a second section of the questionnaire if the results indicate

that this may be necessary or (2) opt to complete an analytical grid of difficulties faced in terms of reading and writing if the results show that the student is not likely to have dyslexia/dysorthographie. Once the student has completed the second section of the questionnaire or analytical grid, the system suggests a variety of help tools linked to the diagnosed difficulty or problems encountered.

C. The Portfolio

The Portfolio tab gathers all the results obtained for each activity completed by the student in SAMI-Persévérance TA. It presents a table of contents as a scrolling list to facilitate finding student data. *My Personal Information* allows each student to consult the information completed in the registration form and to make any necessary changes. *My Help Tools* lists the tools that each student has selected in terms of his/her needs and learning preferences. *My Tracking Results* presents the results that the student has obtained in tracking tests on learning disabilities as well as a list of tools or help resources according to the learning disability or disabilities he/she has explored. *My Learning* recommends learning contents to the student who has completed an analysis of competencies in research. *My Learner Profile* lists the results obtained for the five questionnaires that aim to establish the student's learning profile. *My notes* records comments, reflections and information elements that the student has noted in his/her log.

IV. METHODOLOGY

In order to validate the contents of the support tool SAMI-Persévérance TA, we used the *Learner Verification and Revision* (L.V.R.) method. This method focuses on the user, is characterized by flexibility and is well adapted to the context in which the product will be used (Nguyen et al^[34], 2008). It allowed us to identify and correct errors and problems (Doak, Doak and Root^[35], 1996 ;Thulal^[36], 2003; Maddrell^[37], 2008) and to effectively validate a prototype in the course of development with a sample of the target users for whom it was created. This method, also known as a user trial, has also been used in learning object development research (Sauvé and Hanca^[38], 2008; Sauvé and Royer^[39], 2008; Sauvé and Pépin^[40], 2009). The process involves validating the prototype through a sample of the target audience in order to measure its effectiveness.

In the present study, the sample is comprised of students who registered with SAMI-Persévérance between September of 2010 and December of 2011. Respondents were alerted to the research and signed a consent form that confirmed their participation in the evaluation of the help tools in SAMI-Persévérance TA. Three instruments of measure were used to collect data from participants:

- *The Mini-Questionnaire for Evaluation of Tracking Tools (online)* is comprised of eight statements with five items (Strongly agree to Strongly disagree) and we added "Does not apply". An open-ended question allows the student to evaluate the tool's quality in terms of structure and its contents as well as pertinence. This questionnaire was integrated into each tracking tool, only takes a minute to complete, and is administered right after using the tracking tool in question.

- *The Mini-Questionnaire for Evaluation of Help Tools (online)* is comprised of six statements with a three-part scale (Yes/No/A Little) to evaluate the quality of the structure as well as the pertinence of the contents of the help tool to solve the difficulties. This questionnaire was integrated directly into each help tool, takes 30 seconds to complete and is administered right after using the help tool in question.

- *The Questionnaire on the SAMI-Persévérance TA Help Tool* groups questions according to four categories of variables being studied: (1) the ease of use of the tool; (2) the contents; (3) the design and (4) the interactivity. The statements use an appreciation scale with five items aiming to determine the degree to which respondents agree or disagree with the statements corresponding to each criterion. The questionnaire is administered at the end of the experimentation with the tool.

V. ANALYSIS OF RESULTS

The presentation of results is preliminary because the experimentation of the tool ends in December of 2011. As of the 31st of May 2011, 181 people had responded to the mini-questionnaire: 62% were women and 38% were men. Lastly, 53.68% of respondents study full time and 36.34% study part time.

A. Help Tools

Table 1 shows that the majority of respondents were captivated by the contents of the tools. 80.8% examined all the help tools fully, while 16.7% used only a part of the tool fully. Lastly, 2.5% of students that accessed these tools only used a part of it. A few comments illustrate how much the students appreciate the tools: "Great!", "Very useful, it was a pleasure to watch the videos and to do the exercises".

Table 1. Evaluation of Help Tools (%)

	Yes	No	A Little
Motivation /interest			
I examined the contents of the help tool.	80,8	2,5	16,7
Interface structure			
The help too offers a textual and visual content that is easy to read and to understand.	87,9	6,1	6,1
Navigation in the tool is easy.	89,4	3,0	7,6
Effectiveness of tool to counter difficulties			
The help tool responded to my needs.	83,2	7,6	9,2
The help tool kept my interest.	81,8	3,0	15,2
I would recommend it to a friend.	83,8	3,0	13,2

In terms of the structure of the help tools, the text and visual content is perceived as being easy to read according to 87.9% of respondents, more or less easy to read by 16.7% and hard to read by 7.6%. Navigation in the tool is perceived by respondents as being easy for 89.4%, more or less easy by 6.1% and difficult for 3.0%.

In terms of output of tools according to difficulties faced, Table 1 shows that the tools responded entirely to the needs of 83.2%, more or less responded to the needs of 9.2% and did not respond to their needs at all for 7.6%.

81.8% of respondents recognize that the tool kept their attention and interest, compared to 15.2% who stated that it retained their attention and interest only partly and 3.0% stated that it did not keep their attention or interest at all. Finally, 83.8% of respondents would recommend the tool to a friend, compared to 13.2% who would maybe recommend it to a friend and 3.0% who would not recommend it to a friend at all.

B. Tracking Tools

In terms of tracking tools, by regrouping the responses Strongly agree, Agree and Somewhat agree, Table 2 shows that students consider that the navigation in the questionnaire is easy (97.8%), that the presentation of text is clear (100%) and lastly that the audio content is clear and the voice levels are fine (92.3%).

Table 2. Evaluation of the Tracking Tools (%)

Statements	Strongly agree	Agree	Somewhat agree	Disagree	Strongly disagree
Structure of the tool					
Navigating the questionnaire is easy.	58,30	33,30	5,60	2,80	0,00
The presentation of the text is clear (characters, colors, effects) and well spaced (layout, quantity of content).	63,90	27,80	8,30	0,00	0,00
Audio content is clear and the voice levels are fine.	53,80	23,10	15,40	7,70	0,00
Contents of the tool					
Reading the instructions is helpful.	59,39	31,27	9,34	0,00	0,00
The audio instructions are helpful.	60,00	20,00	15,97	4,03	0,00
The number of questions in different sections facilitate the task.	51,39	37,10	5,76	5,76	0,00
The questions or statements are clear and comprehensible.	51,44	37,14	8,54	2,88	0,00
Pertinence of the tool					
The results obtained motivate you to make a decision and to take a next step.	50,00	16,67	33,3	0,00	0,00

Concerning the content of the tools, the provided readings are considered helpful for 100% of users as well as the audio content for 95.97% of users. The number of questions offered in the tools facilitates the task (94.24%), and these questions or statements are formulated in a comprehensive manner (97.22%). Finally, the respondents mentioned their intention to make a decision or to take a next step after consulting the results obtained.

VI. CONCLUSION

Available anywhere, online interactive and multimedia help tools for perseverance in postsecondary studies for students with learning difficulties, according to preliminary results, allow this clientele positive learning and interaction experiences. Furthermore, they students benefit from immediate feedback, thanks to tracking tools, concerning their learning difficulties. They are then guided, if need be, to help tools adapted to their specific needs.

The first results of the trial allow us to postulate that SAMI-Persévérance TA supports a vast majority of students with difficulties who consulted the tool. Their answers to mini-questionnaires show that they are very satisfied with the tracking tools and the help tools in terms of structure, contents, way of supporting motivation and pertinence. We conclude that there is a high level of satisfaction on the part of the students in terms of the help provided by the help tools for difficulties that they face during their academic pursuits.

SAMI-Persévérance TA is accessible at the following address: <http://taperseverance.savie.ca>.

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Dr. Louise Sauvé, Professor at Télé-université, doctorate in Educational Technology and Director of the *Center for Expertise and Research in Lifelong Learning* (SAVIE). Numerous awards, she has led more than 250 presentations and workshops nationally and internationally, established approximately 20 university distance education courses, and published more than 160 summaries and articles in six different languages, and 13 books/collections.