Failures in the *Quantitative Methods* course in Social Science:

The Student Perspective

Olivia Le Bourdais and Isabelle Cabot

The *Quantitative Methods* course is a pet peeve of many Sciences Humaines (SH) [the French-language equivalent of Social Science, Ed.] students. It's "the math class even in the non-math profile," as many describe it! Not surprisingly, it's a challenging course (Monatesse, 2011; Dussault, 2015), that is failed by more than 20% of those enrolled. In the context of the implementation of the new SH program in the Fall 2023 session, it is a favourable time to discuss the reasons for such a high number of failures in this course, in order to seize the opportunity to try to improve its success rate.

Olivia's observation

My observation of the problem with the *Quantitative Methods* (QM) course came early in my social science career. In fact, when I took the course myself during my college studies, I asked myself the question: "Why do so many of my peers fail it?" I remember when our teacher explained the phenomenon of the normal curve and compared it with our midterm exam results. The line on the graph was quite different from a normal curve, being the complete opposite, i.e. a "U"-shaped curve. The majority of students were at the extremes of the curve, either excelling or failing catastrophically. What could account for such wide variation from one person to the next?

When I became an SH teacher, I taught this challenging course. As I began my master's degree with Performa in 2019, I wanted to gain a better understanding of the catastrophic failure rate in this course, especially since my perception of the problem was reinforced by my colleagues' reports of the many difficulties students encountered and their complaints about this required course in SH. Therefore, the main objective of this research study was to gain a better understanding of the causes of the excessive number of failures in the QM course, by examining the perspective of the college students enrolled in it.

This article presents the research approach used to highlight the student perspective on the causes of failures in the QM course. This could serve as a lever to inspire teaching staff

who wish to improve the experience of students enrolled in this or other courses and thereby increase student success rates.

The role of the QM course

As part of the pre-university SH program, students are required to apply the scientific approach (MEES, 2021). In this context, the QM course allows them to learn how to analyze data, using tables and graphs or mathematical operations, in order to determine, for example, the nature and intensity of relationships between variables. This course has been part of the curriculum since 1992 (Gattuso & Vermette, 2013), following pressure on schools from the National Council of Teachers in Mathematics (NCTM)—the world's largest mathematics education organization, based in the United States since the early 1980s (NCTM, 2019)—to improve mathematics education. In fact, the teaching of statistics and probability has also been implemented in elementary and high schools in Quebec since that time (Gattuso & Vermette, 2013).

In the structure of the SH program that is now coming to the end of its lifecycle, the QM course was generally taken in the first session, or at least in the first year of CEGEP, as a prerequisite for two other mandatory courses (MEES, 2017). From year to year, the QM failure rate varied between 22% and 26% (SRAM, 2019).[1] As such, failure of this course could compromise or even jeopardize an SH student's graduation. Moreover, a statistical study conducted by the Service régional d'admission du Montréal métropolitain (SRAM) in 2004 highlighted that students who

passed their classes in the first session were significantly more likely to obtain their Diploma of College Studies (DCS) than those who did not pass all of their classes (Ducharme, 2012). What's more, when we group students according to their success or failure in QM, we can see that the re-enrolment rate for the following session is different.[2] For example, when students pass their QM course, the re-enrolment rate is over 70.7%, while when they fail it, the re-enrolment rate drops to 33.3%.

The literature review conducted in the fall of 2019 revealed that the difficulties related to the QM course experienced here in Quebec are also present in other parts of the world, such as the United Kingdom (MacInnes, 2014) and the United States (Wagner, Garner & Kawulich, 2011; Bridges et al., 1998). Despite the differences in educational systems, these studies report that students are not well prepared to understand quantitative research findings when they enter graduate school. Many educators have tried to remedy this situation in Quebec, mostly with success. For example, in their reported stories, Laflamme (2019) and Gagnon et al. (2011) cite difficulties in learning mathematics and lack of student attendance in QM as causes of failure in this course and describe how they addressed the problem by modifying the course. For them,

novel pedagogical strategies, such as problem-based learning and active learning classroom (ALC) teaching, proved effective.

However, one question remains: from the students' point of view, what are the causes of failures in QM? While we can infer the causes of failure from the literature that identifies predictors of academic failure (e.g. lack of motivation), no studies have asked the question directly to the individuals involved. The present study therefore focuses on the students' perspective and aims to identify the causes of the low success rate in the QM course that is part of the SH college program.

Methodology

The purpose of the exploratory survey conducted among students enrolled in QM was to compile a list of reasons for failing the course. Ironically, qualitative, open-ended questions were used to collect the data. Despite a thorough review of the literature on possible causes of failure, such as lack of motivation, stress and anxiety, teaching-related factors, transition from high school to college and certain learning disabilities, the intention was not to put words in students' mouths, but to allow them to freely express the difficulties they experienced in this course. In addition, the question was posed in a way that allowed them to

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[1] Pandemic sessions were not included to avoid bias, since during the pandemic a student could request an incomplete without any specific reason, so that as soon as a student failed, they requested an incomplete. Incompletes are not counted as failures and therefore bias the failure rate.

[2] Based on queries to SRAM's Profil scolaire des étudiants par programme [Student Academic Profile by Program, Ed.] (SAPP) system.

answer impersonally, in order to limit social desirability bias (Cabot & Facchin, 2020): "Imagine someone who is having difficulty succeeding in QM. What do you think are the reasons for their difficulties?" Many of the responses were consistent with the literature review and our expectations. However, there were also a few surprises.

The vast majority of those who participated in this research were students ($n = 126$) enrolled in the QM course in the Winter 2021 session[3] at the Cégep de Saint-Jérôme (see **Table 1**). This was a good representation of the target population, i.e. students enrolled in SH at a CEGEP. It should be noted that the teachers of the QM course ($n = 6$, representing 3 SH disciplines) also participated in the survey by expressing their perceptions.

As this is an inductive interpretive research study, the questions were designed to allow as many spontaneous answers as possible. They were inspired by similar studies, such as those by Roland, Frenay and Boudrenghie (2015) and Laroche (2017), which contributed to their validity. Participants were also invited to participate in a short interview so that we could deepen our understanding of their responses. Few students agreed to be contacted in this way. Of these, only one student failed the course, three students requested an incomplete[4] and one student received a final grade of 100%. Finally, the teaching staff were asked to complete a questionnaire consisting of questions generated during the analysis of the student data. The main question asked the six targeted faculty members to rank the causes of failure in QM from most to least common, from a list provided. This list consisted of the 10 causes most frequently expressed by the students, presented in alphabetical order.

Table 1

Profile of the sample compared to cohorts of the past five years

Category		Average number of students over the last five years (%)	Number of students in sample (%)
Gender	Female	119 (60.7 %)	88 (69.8 %)
	Male	77 (39.3 %)	37 (29.4 %)
	I'd rather not say	n/a	1 (0.8 %)
Profiles	Social Science, Commerce profile	38 (19.4 %)	18 (14.2 %)
	Social Science, Psychology profile	133 (67.9 %)	72 (56.7 %)
	Social Science, Global Citizenship profile	24 (12.3 %)	23 (18.1 %)
	Other or missing data	1 (0.5 %)	13 (10.3 %)
Learning disabilities	Yes	14 (7.1 %)[5]	20 (15.9 %)
	No	182 (92.9 %)[6]	106 (84.1 %)

[3] While it would have been desirable to collect data after the pandemic, it was preferable to complete the research before implementing the new SH program. What's more, at that point we didn't know when a return to face-to-face teaching would be possible, the pandemic being so unpredictable.

[4] At this point in the COVID-19 pandemic, a student could request an incomplete without any supporting documentation, simply by mentioning COVID-19 as the reason, until after the final grades were due.

[5] The data here do not represent learning disabilities, but rather the number of registrations with the college's Service d'aide à l'intégration des étudiantes et étudiants (SAIDE), since nominal data are not available.

[6] The data here do not represent people without learning disabilities, but those who are not registered with SAIDE.

Student perspective on QM difficulties

First, it is important to mention that 32.5% of the participants expressed difficulties in their QM course. Chi-square test results indicate that there is no significant relationship between the difficulties encountered and the SH study profile or gender. However, at the 95% confidence level, there is a positive relationship between learning difficulties and difficulties in QM.

As mentioned earlier, in order to avoid social desirability bias, a question was asked about the perceptions of others. Some important contrasts were identified by comparing personal responses with those given when the students put themselves in the shoes of others.

Comparison of personal and other people's difficulties in the QM course

Legend: Reasons for personal difficulties — Reasons for other people's difficulties
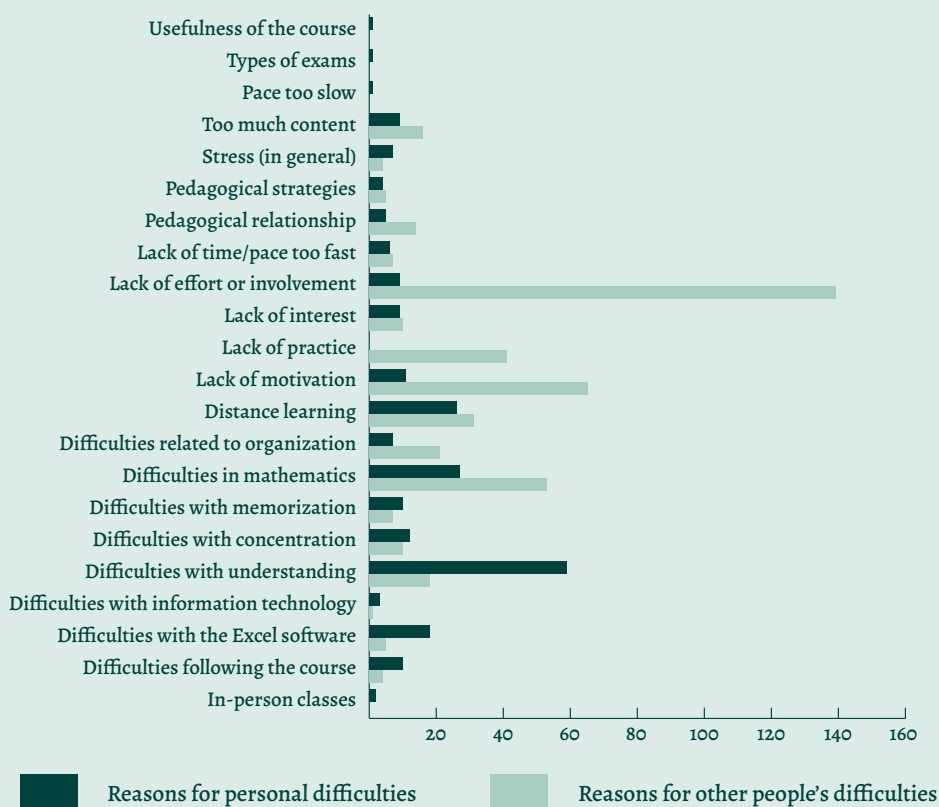
This figure shows the predominance of difficulties related to understanding, mathematics, and distance learning as the main reasons for demotivation and difficulties encountered by students in their QM course, when they answered for themselves.

However, one category stands out from all the others when participants put themselves in someone else's shoes: lack of effort or commitment. If this reason was rarely expressed about oneself in order to protect one's personal image, it is possible that the desirability bias was circumvented by adding a question about others. Thus, the total list of reasons may be exhaustive.
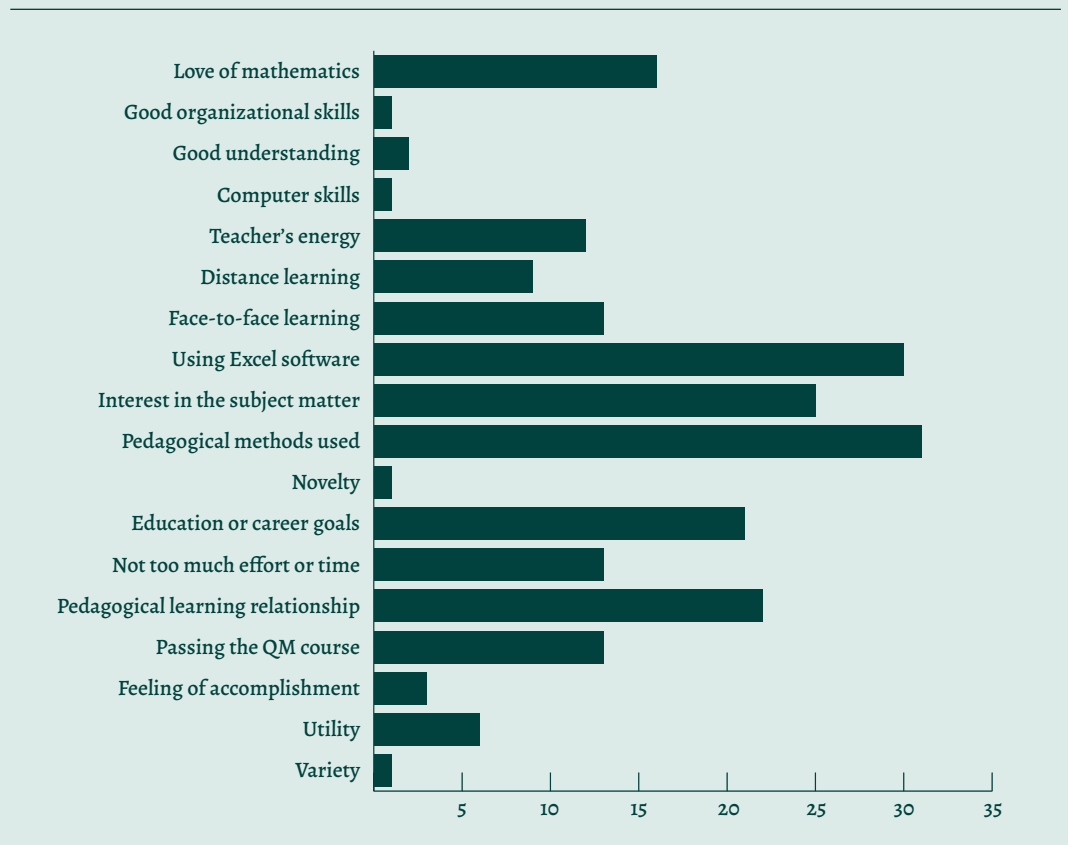
The main reasons for taking the QM course

In order to obtain possible solutions for improving academic success in the course, students were also asked to answer the question "What motivates you in your QM course?" **Figure 2** shows the frequency of the response categories obtained.

Figure 2

Motivations for taking the QM course

It was surprising to discover that interest in the subject matter and the use of Excel software were a source of motivation for many to take the QM course. In fact, this course gets so much bad press that it's easy to forget that there are students who really want to learn its content, as indicated in this sample (25 occurrences). Furthermore, the most common response (31 occurrences) concerns the pedagogical methods used in the course. It would have been interesting to know which methods the respondents were referring to, but since the questions did not guide the answers, it was not possible to obtain this information.

Teacher perception

SH teaching staff were asked if they perceived the same difficulties as students, in the same order of importance. It was surprising to find that the main cause of difficulties in QM is not the same from the teachers' point of view as from the students'. In fact, difficulties in mathematics are at the bottom of the list in order of importance according to teaching staff, while for the students, this difficulty occupies the first place. This difference could be explained by a cognitive bias (or thinking shortcut (Gauvreau, 2021)). Those who find the mathematical content of the QM course easy may not imagine all the difficulties that this content can cause for others. There's a need for awareness that could lead to some great pedagogical interventions to be tested. On the other hand, some difficulties were consistent between the two points of view, such as the lack of effort and organization. We see this when students mention a lack of effort or involvement as reasons for difficulties,

and teaching staff members stipulate that making an effort while getting involved is a guarantee of success.

Some recommendations

Solutions were put forward directly by the students, who were asked to answer a question along these lines. From their point of view, many practical exercises are needed to properly integrate the QM course material. In addition, students mentioned having

access to a help center and mentoring, as well as closer follow-up, as solutions for improving MQ success. Many of these strategies may already be in place in some CEGEPs, with mathematics help centres offering mentoring, as well as Social Science centres. Unfortunately, many students who could benefit from the help offered by these centres don't show up, mainly because of a perceived lack of time, difficulties with centre logistics, lack of motivation or negative emotions towards the centre (Vohl, 2021;

Cabot & Facchin, 2020). As for closer follow-up of students with difficulties, this is a solution at the discretion of each teacher, as it is rather difficult to implement formally. However, there are a number of student success projects that could alleviate this need. In fact, the Cégep de Saint-Jérôme, where the study took place, has a project in place in which another member of the teaching staff assists the QM teacher in the classroom on the day of the labs, so that two people are available to answer students' questions.

As a result, the teacher providing the course has more time in the classroom to provide more personalized attention to struggling students, while the assistant, another teacher benefiting from release time, can answer more frequent questions during the practical exercises on the Excel software. In this way, the "closer follow-up" solution expressed by the respondents can be put into practice in the classroom.

On another note, given a certain polarization of responses, such as

"the course is too fast" or "the course is too slow," as well as "difficulties in mathematics" as a reason for obstacles to success or "love of mathematics" as a reason for motivation, it may be beneficial for students if more homogeneous groups were formed, as is the case in French or English as a Second Language classes. In addition, those in the weaker math groups could benefit from more extra periods with two teachers present in class, compared to the stronger groups. More Excel labs would also be a solution to consider. As some have already done, and as it also helps with student motivation, continuing to update and innovate pedagogical strategies would be conducive to course success. Although this research took place during a pandemic, a common response from students should not be overlooked: many cited distance learning as one of the causes of their difficulties. It is therefore important to ensure a high level of face-to-face teaching, perhaps with the addition of distance learning resources for those who prefer this learning context. In addition, knowledge about mathematical anxiety and ways to reduce it (Lossi, 2007) could inspire ideas for pedagogical interventions to be tested in QM groups, with the aim of reducing the anciety that some people feel about this course. These possible solutions would undoubtedly lead to an increase in positive experiences in the QM classroom, potentially improving student success.

Source: Jade Pilon

Conclusion

Overall, this research study, although fraught with many limitations such as the pandemic and distance learning, was able to achieve its goal of contributing to a better understanding of the causes of the low success rate in the QM course in the SH college program from the students' perspective. We are now better informed about the reasons for these difficulties and have been able to confirm or refute some of our perceptions in this regard. We now know that more students than we may have realized are experiencing difficulties in mathematics and in their understanding of the concepts taught. What's more, we know that our pedagogical strategies motivate many of them, as do the Excel labs. We have learned that the services we already offer can be useful, but that many students need closer follow-up when they experience difficulties. Solutions in this direction could be developed to contribute to the success of the course. This is an excellent time to do so, with the implementation of the new program; CEGEPs can take advantage of this context to improve student success, and who knows, maybe even the reputation of the QM course. ▬

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Olivia Le Bourdais has been teaching psychology at the Cégep de Saint-Jérôme since 2013. She holds a bachelor's degree in Psychology, a certificate in Psycho-Education and a master's degree in College Teaching. She was also a pedagogical counsellor at the same CEGEP to lead the implementation of an active learning classroom in 2017. As a co-coordinator of the Psychology department, she is also a member of the implementation committee for the new Social Science program.

olebourdais@cstj.qc.ca

Isabelle Cabot has been teaching psychology at the college level since 2004. She holds a Ph.D. in Educational Psychology from the Université de Montréal and has been conducting research on college students' motivation since 2010. Her main research interest is the stimulation of individuals' motivation in contexts of disengagement or underachievement. Her expertise lies in the processes involved in the development of interest. She is very active in the promotion and development of research at the college level and directs the research projects of teachers enrolled in the Performa master's program.

isabelle.cabot@cegepmontpetit.ca