

Introduction to the Impact of a Learning and Management Skills Course as perceived by the students

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Abstract—This research work in progress examines the impact of a learning and management skills course on first year of engineering studies, as perceived by the students. The purpose of the course is two-fold: 1. Improve essential learning skills for future Generation Z engineers in the 21st century. 2. Reduce undergraduates' dropout from engineering studies.

The course is based on student-centred theories and learning approaches and was given during the first semester of engineering studies at Shenkar College of Engineering, Design and Art. The course made use of dynamic content, access to information, group and individual tasks, interaction and reflection. Twenty-eight students participated in this 4-month course. Evaluation and monitoring tools include observations, questionnaires, as well as performance ranking of short- and long-term tasks during the course duration.

This paper summarizes the planned assessment and evaluation methods to compare quantitative and qualitative results. Preliminary results show a positive trend regarding students' perception of the effect of the course and the application of study skills strategies to their academic work.

Keywords—learning skills, management skills, metacognition, procrastination, generation Z, motivation, mindset, academic readiness, student perceptions

I. INTRODUCTION

Diverse students come from a variety of backgrounds and experiences that make each one unique. They are high school graduates and begin their first year of college. They all have the same focus: to obtain a degree, such as engineering, that can take them on a path of professional success and economic well-being. The new students are curious, motivated and have the basic requirements, thanks to which they were accepted in the higher education institution. However, according to the American Society for Engineering Education [1], 40% of engineering students eventually drop out or change their careers. More than 27% do not even finish the first year [2]. The main reason why students drop out of engineering programs is the lack of preparation for the high level of rigor. In Germany,

the German Engineering Association has launched a project that involves several actions for institutions that want to improve the quality of their teaching in engineering programs [3]. The rates of dropout at the Spanish technical sciences registered rates even exceed 60 % [4].

There are several reasons why undergraduates' dropout engineering studies. Part of the reasons are personal, such as the cost of studies or unexpected constraints. Despite the importance of these factors, they do not cause most dropouts and will not be addressed in this study.

A. Generation Z' students

To understand the difficulties that students face today, it is necessary to understand some general characteristics of the new undergraduates' student. These characteristics are ambiguous and varied and yet, previous studies [5] indicate that in each generation, despite diverse socio-economic backgrounds, a cultural climate dominates. Many of these difficulties are part of issues that the college can influence on them, and perhaps reduce dropout.

Today's tertiary students are what is called Generation Z (Gen Z - 1995 ~ 2010) [6]. They are true digital natives: from earliest years of youth, they have been exposed to the internet, to social media, and to mobile systems. That context has produced a hypercognitive generation, very comfortable with the collection and cross-referencing of many sources of information and with the integration of virtual and offline experiences. They have a much higher need for technology-based stimuli compared to previous generations, which leads to a disinterested attitude toward traditional education methods. Many of them were digital-literate before they were ten years old. They have different attitudes and aptitudes to their predecessors. Their outlook is sometimes called the "conceptual-age" mindset" [7], where creativity and empathy are more relevant. Today's students are better multi-taskers, less focused, capable to learn new things by themselves, or through a more efficient and non-traditional route than those of yesteryear. They are more entrepreneurial, more global, great in individuality and have higher expectations than Millennials

(Generation Y). The comfort level of technology for many teachers is low relative to the level of their students. This may lead to an apathetic and indifferent attitude among students. Unfortunately, this can be misinterpreted as a lack of interest in study subjects and, in certain courses, the absence from lessons lessens the chances of success.

B. Study and management skills for student engineers in the 21st century

First, In the last ten years there has been an increase in the emphasis on "soft" skills in engineering programs reflecting the requirements of employers and professional bodies [8, 9]. Implementation of study skills and professional skills in the higher education have become increasingly common [10, 11]. Providing study skills support for college students has several purported benefits. There are claims that those skills can reinforce transferable skills such as communication, teamwork, and research skills, foster student independence, enhance intellectual development, promote a deeper approach to learning, increase self-confidence, and self-efficacy in students, help with the academic process and professional socialization, and reduce attrition derived from academic failure [12, 13]. Other studies showed that learning theories (behavior, cognition, constructivist, and socially situated learning) and student-centred methods (active learning, project-based learning, and collaborative learning) may be a promising way to incorporate digital literacy in an effective way [14,15].

Despite the benefits of supporting learning skills and the fact that such support can reduce college dropout, there is little evaluation evidence in the engineering education literature [16]. Much of contemporary literature takes the form of expert opinion [17,18] on the skills required and does not address the perceptions and difficulties encountered by new students. In a survey involving engineering students from 5 UK universities, less than 10% of students reported that the study skills studied had been useful, while 41% found it unuseful [19].

II. DESCRIPTION OF THE STUDY

The study examines the impact of a course on learning and management skills, on first year engineering students. The purpose of the study was to develop an understanding of students' thoughts, perceptions and needs attending the course. The study included 28 students, from 21 to 27 years old with diverse family status: single, married, with/without children, and from different gender.

Shenkar College holds a unique course focusing on developing learning and professional soft skills, in the Engineering faculty. The course is dynamic, student-centred, employing group and individual assignments, promoting interaction and reflection, and organized to tactically manage the audience's attention span.

The course is elective and given in the first semester of the first year in college, 2 hours per week. Each meeting touched a different topic of learning and management skills. The syllabus is based on 4 skill sets: (1) planning: goal setting and time management, (2) information processing: note taking, summarizing and memorizing, (3) assessment: test taking and

assignment writing, and (4) self-management: self-efficacy, motivation and commitment ethic skills. Although much of the content was generic, it was adapted to the engineering discipline.

III. CONSIDERATIONS LEADING TO COLLEGE SUCCESS

There may be many considerations that promote success in higher education and especially in engineering, which is a difficult field with a high dropout rate. In this study we focus on three considerations. The first consideration is the students' *academic readiness*. This consideration is the result of the work done by teachers and mentors during high school. The second consideration is the *study motivation* with which students begin engineering studies. The third consideration is the *students' mindsets*, which means the attitude of the students when facing challenges during college. Although the last two considerations appear to be similar, initial motivation (why they chose engineering studies) should be distinguished from how they perform when the situation is tense.

A. Academic readiness

Studies of successful college students show that their high school academic readiness is clearly linked to college performance [20, 21]. This is the baseline of the learning skills with which new students enter college. Academic readiness can be divided into three key topics: 1. *key cognitive strategies*, 2. *key content knowledge* and, 3. *academic behaviors*. *Key cognitive strategies* are related to the level of some learning skills with which they begin higher education. It addresses intentional behaviors that allow students to learn, understand, maintain, use and apply content from a variety of disciplines. This include the ability to infer, interpret results, analyze conflicting source documents, support arguments with evidence, solve complex problems with no obvious answer, reach conclusions, offer explanations, conduct research, participate in the exchange of ideas and, in general, think deeply about what is being taught [22, 23]. *Key content knowledge* is the core knowledge of content required to understand the academic disciplines of study, including reading and writing skills and knowledge in the academic core subjects, such as English, mathematics and physics [24]. *Academic behaviors* are self-management skills, attitudes and habits necessary for students to face the challenges of workload and university rigor [25].

B. Study motivation

Motivation has been defined as the level of effort that an individual is willing to invest to achieve a certain goal [26]. In psychology, motivation refers to the initiation, direction, intensity, and persistence of behavior [27]. Motivation is stimulating, intentional, and behavioral and can be intrinsic or extrinsic [28]. Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable [29]. Intrinsically motivated students use strategies that require more effort and enable them to process information more deeply. In contrast, extrinsically motivated students tend to make the minimum effort to obtain an award [30]. Extrinsic motivating stimuli may include, but is not limited to, pursuing a college degree, a career entry, fear of failure, personal recognition, money, joy for parents, friends, etc. Extrinsic motivators don't work well in the long term and are often detrimental [31].

C. Students' mindset

According to previous studies [32, 33], students' mindset (the way they perceive their abilities), plays a key role in their motivation and performance. Changing the mindset of students can increase their achievements. Specifically, students who believe that their intelligence can be developed (a growth mindset) outperform those who believe that their intelligence is fixed (a fixed mindset). When students learn through a structured program that they could "grow their brains" and increase their intellectual skills, they perform better. Growth-minded students took charge of their learning and motivation. Rather than delving into thoughtless memorization of the course material, they look for underlying themes and principles in the lectures and review mistakes they made until they were sure they understood them. Growth-minded students focus on learning, not just passing the exams. They have a high intrinsic motivation and may be more resilient. Rather than losing their motivation when the course becomes boring or difficult, students with a growth mindset keep their interest in the material and remain positive, thus maintaining their motivation to study.

IV. DATA COLLECTION

Quantitative and qualitative approaches enable an understanding of participants' experiences [34]. The evaluations were done in 2 levels: The cognitive level: declarative knowledge on learner strategies, procedural knowledge (defined as knowing how to use strategies), and conditional knowledge (defined as knowing why and when to use strategies). The performance level: planning, execution process, evaluation of the effectiveness of the execution process, information handling strategies, and improving the execution process.

A. Quantitative evaluation

Two parameters were studied with quantitative tools: Metacognitive Awareness and Procrastination. Metacognition is a concept in psychology that means high-level thinking and includes active supervision of thinking, planning, navigation, comprehension, progress assessment, etc. [35]. It is related to the individual's ability to be aware of his thinking process and its application. The questionnaires, in which a student reports on his thinking and its application, typically

allows the student to be aware of his metacognitive thinking process.

Time management is recognized as one of the major factors of success in traditional educational settings, where college grades are strongly influenced by time management skills [36]. Individual differences in aspects of time management have been identified in learning settings, with procrastination being one of the most important. Procrastination has been defined as the tendency to delay initiation or completion of important tasks, or to postpone tasks to the point of discomfort. Several studies have examined the relationship between procrastination and academic results [37, 38] and have found that academic procrastination is related to a lower performance in the tasks and in the underlying processes of self and social regulation. Therefore, this is an important parameter that affects students' chance of success.

Two quantitative research tools were used in this study:

- A Metacognitive Awareness Inventory (MAI) [39] to assess the metacognitive level of the student that consists of 52 questions. MAI includes several subscales assessing knowledge of cognition (declarative knowledge, procedural knowledge, conditional knowledge) and regulation of knowledge (planning, information management strategies, monitoring, debugging strategies and evaluation). This questionnaire was evaluated twice, at the beginning of the course and at the end of it.
- An Academic Procrastination Scale (APS) [40], which is a questionnaire consisting of 25 questions that was evaluated once during the course.

Both quantitative research tools are scored on the five-point Likert scale ranging from totally disagree 1 to strongly agree 5. Questionnaires responses were correlated with observations, monitoring, and open-ended questions, made to students during the course.

B. Qualitative evaluation

Qualitative research is aimed at giving voice to people's subjectively lived experiences and values [41]. Consequently, a qualitative exploration of participants' thoughts, feelings, and perceptions while attending a study skills intervention program could help researchers to develop a more nuanced understanding of students' needs as they strive to improve the academic success.

Quality data was collected from all students through individual interviews and monitoring. In this study we will focus on 2 guiding questions: (1) "Can you describe, as much as possible, how you experienced the course?" and (2) "What was good / bad / missing in the course?"

V. PRELIMINARY RESULT

The objective of the proposed study is to improve the learning experience of students by providing them with learning and soft skills through a course, upon entering college. Therefore, the main objective of this evaluation is to discover if there was any improvement in the understanding of various concepts regarding the studies and how to face them. The results of the assessment are based on qualitative monitoring and on

asking students to answer a list of questions about the usefulness of the course and quantitative questionnaires.

Preliminary results show a positive trend regarding students' perception of the effect of the course and the application of study skills strategies to their academic work. Some results of the research will be presented at the conference.

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