Lessons Learned from Sudden Transition to On-line Learning

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Abstract. The sudden shift from the lecture theatres and laboratories to a laptop or smart phone screen due to the restrictions caused by the pandemic 2020 crisis, changes the students' way of working in the academic environment. The present paper investigated the engineering students' perception of the changes occurred during this period. The investigation was based on a questionnaire, aiming to point out evidences on premises which can be used in designing new learning environment in the future. Promising premises regarding students' willingness for learning in on-line environment exist, and this can push the on-line learning to become a consistent part of the curriculum. There will be necessary a special focus on courses design and also on remedial consultancy for students for their personal development.

Keywords: On-line learning during coronavirus crisis · Transition to on-line learning

1 Introduction

The 2020 global pandemic event due to the spread of the new COVID-19, caused unprecedented changes and challenges in all sectors of the socio-economic system, affecting everyday life aspects [1]. The educational system is facing the transition to on-line activity, no matter if it was or not prepared for this shift, the main challenges being the access to technical infrastructure, competence and pedagogies for on-line learning and the requirements of specific fields of study [2]. At the same time, the forced transition offers opportunities to propose more flexible learning possibilities and to explore blended learning [2].

From the mechanism of change theory in organization, is known that growth is tied with the crisis. The change is expected to occur when the positive forces act as drivers and the negative ones are counterbalanced [3].

The systems theory explains the steps a system passes when a disruptive event takes place. When a disruptive event acts on a system existing in its original state, the system enters in disrupted state, characterized by vulnerability and survivability actions. In response, a recovery action takes place enabling the system to recover, by re-establishing its structure and relations to enter in a stable recovered state [4].

When these assumptions are translated to the educational system during and after the pandemic crisis, it is assumed that the system, after the crisis will be recovered and

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brought to a new stable state. Compared with the initial state, the new one might represent growth if the internal structure and relationships are exploited as positive forces to drive the change. The recovery is complex, it involves both top-down and bottom up approaches, and is under debate at international level [5].

Considering that students are the main actors in the educational system, and each action is taken need to be based on evidences [6] and addressed from their perspective [7], the investigation was conducted to explore the students' view on the experience they went through the pandemic crisis, as basis for designing transition to digitalization of the higher education, as desideratum, at least at the local level.

2 Data Collection and Interpretation

2.1 The Questionnaire Development

To investigate the engineering students' opinion on the factors influencing their own learning in the forced on-line environment, a questionnaire was developed and applied.

The questionnaire, based on Likert-scale items, comprises 25 statements, clustered in six groups:

1. The use of computers as a habit and the equipment availability. The general term of "computer" was used to denote the electronic learning environment;
2. The personal motivation for studies (personal satisfaction, perceived usefulness of the studies in socio-economic system, and learning willingness), as premises for learning efficiently;
3. The perception of the sudden transition for the on-line learning, as developing negative emotions and feelings;
4. The perception of the on-line learning as new, accepted behavior, after the (almost) one-semester experiencing;
5. The students' insights regarding the educational approach, the "student-centered approach" versus "teaching-centered approach" as premise for the on-line learning;
6. The students' willingness to be involved in future on-line learning experiences.

The target group for the study consists of undergraduate students, involved in engineering (e.g. mechanical engineering, industrial engineering, environmental engineering, electrical engineering, and also computer sciences) study programs. Students' opinion on each statement was quantified (−2 for strongly disagree - SD, −1 for disagree - D, 0 for neutral - N, +1 for agree - A, and +2 for strongly agree - SA) and average value for each item (or group of items) was calculated and/or represented in graphical format. The Google Forms application was used for development of the questionnaire and data collection.

2.2 Students' Responses Interpretation

As it has been mentioned, the investigation targeted the students following engineering studies, including computer sciences, in Transilvania University of Brasov, Romania, after experiencing on-line learning using the Moodle platform implemented at the

university. The questionnaire was distributed after the official restrictions period ended (i.e. mid of May, 2020), and it was available for responses during one week.

A total number of 257 students responses was registered, from which 131 are involved in computer sciences studies (CS) and 126 in other engineering studies (ENG) running the university.

The Use of Computer as a Habit. A basic premise of the on-line learning is the use computers as a habit, since now-a-days students belong to the "digital native" generation [8]. It is known that the technology become an indivisible part of the higher education landscape, even the system is still anchored in traditional learning approach. From Fig. 1 can be depicted the information that the majority of the students highly appreciate the use of computers both for their studies (statement G_1) and for general purpose (statement G_2). During the period involved in the study, the students were not in the university campus, therefore, the lack of equipment (computer/internet connection) was reported as restriction by some students from the ENG group (statement G_3). This lack of equipment may have negative consequences in accepting/practicing the on-line learning.

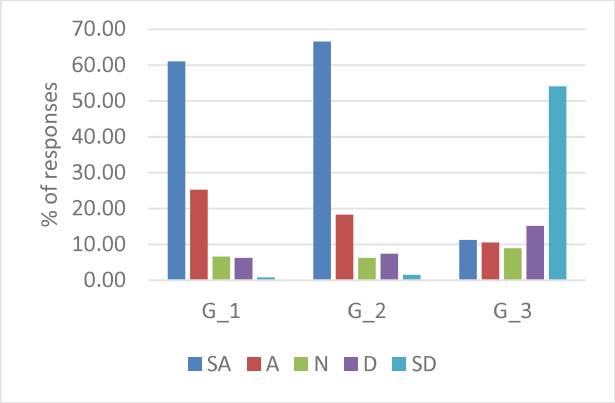

Fig. 1. Students' habits in computer use: G_1 - The use of the computer was a habit, for information in the field of study; G_2 - The use of the computer was a habit, for communication, e-mail, social platforms; G_3 - During the online learning period I had difficulties generated by the lack of equipment (laptop, internet).

Premises for Learning Efficiency. As premises for efficient learning (in general and also in on-line environment) were considered the motivational factors as learning willingness, perception of the studies utility in socio-economic environment, students' satisfactions towards their studies and also the habit of using computers in learning context. It was registered a general positive appreciation of this issue, (1.22 as general average value), the students involved in Computer science studies having a more positive perception (1.55 as general average value) than the engineers' ones (Fig. 2).

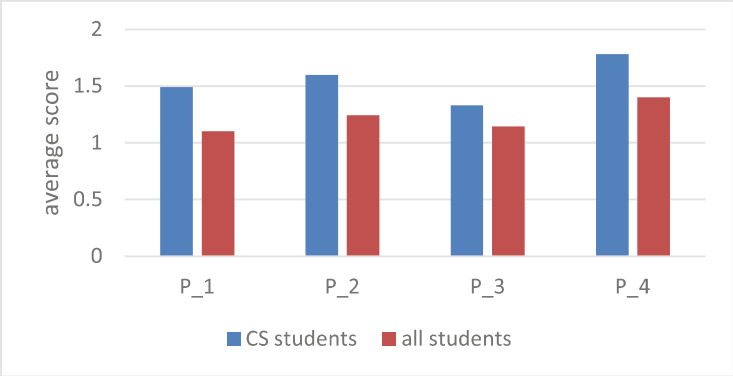

Fig. 2. Premises for learning efficacy: P_1 - I am satisfied with the chosen field of study, I feel that it suits me; P_2 - I am confident that the chosen field of study is important for the socio-economic environment; P_3 - I have always enjoyed learning from any event I have attended, either inside or outside the school; P_4 - The use of the computer was a habit, for information in the field of study

The Perception of Sudden Transition to On-Line Learning. The crisis situation caused by the Coronavirus diseases was governed by negative emotions, feelings, influencing the daily activity [1].

The general students' opinion can be generally described as being a slightly intriguing situation demonstrated by the general average score of 0.44. The value is in fact obtained from very different values between the two groups of students. The general score for the CS students was −0.01, reflecting a quite balanced perception, coming both from positive and negative opinions. The average general score of 0.91 registered for the ENG students, reflects the negative perception of the sudden transition to the on-line learning. The scores for each statement are presented in Fig. 3.

A detailed examination of the answers was done for the statement S_4, to have a deeper understanding of the group of students who declared the working load as overwhelming. In this respect, the students' who rated S4 with "strongly agree" (score 2), were identified as not frequent computer users, those who perceived the transition like a shock (average score 1.09), declared negative feelings (score 0.9) and physical discomfort (score 1.22).

The Habit in On-line Learning. Even for a short time, and during "forced" conditions, on general average, the students are getting used with the on-line learning. The general score was 0.39, but with significant differences between the two students groups: 0.08 average score for ENG students and 0.39 for CS students. As Fig. 4 reveals, both groups agreed that they are getting used with the on-line working, but, as result of working load, the free time is differently perceived (statements H_2 and H_3). The CS students declared their involvement in activities others than those related for the faculty and also for enjoyable ones, which would be necessary to cope the COVID-19 associated negative feelings [1]. Contrary, the ENG students declared a lower

involvement in such activities, fact that can be corroborated with the negative emotions and feelings (statement S_2), Fig. 3.

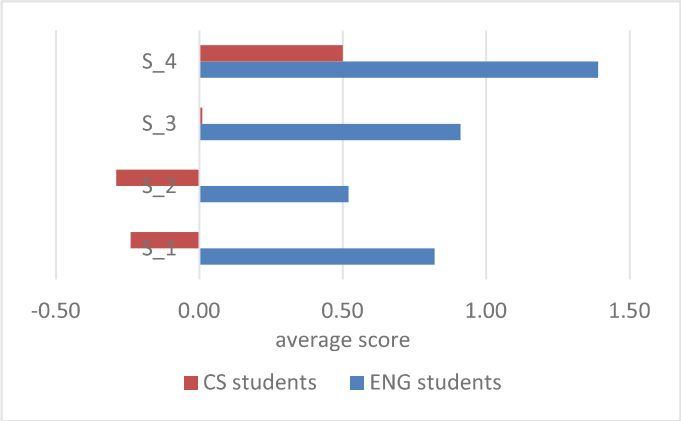

Fig. 3. Students' perception of the sudden transition: S_1 - The sudden transition to online education I felt like a shock; S_2 -The sudden transition to online education caused me negative feelings (anxiety, sadness, fear); S_3 - Practicing online education during the state of emergency caused me physical discomfort (back pain, eye problems, etc.); S_4 - The workload for covering the study tasks seemed overwhelming

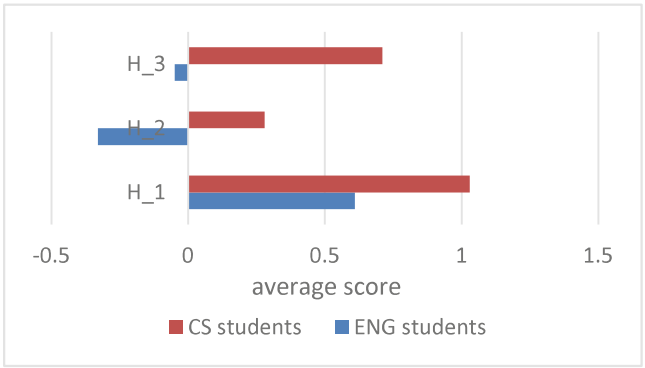

Fig. 4. Students' perception on the habitude to use on-line learning: H_1: During the two months of teaching-learning online, I got used to the way I work; H_2: During the two months of learning online, I had time to carry out other activities that I enjoy; H_3: During the two months of learning online, I had time to carry out other activities, for which I have obligations, in addition to those related to the faculty.

Educational Approach. Students' perception on educational approach followed two directions: (a) the perception of own behaviors during the envisaged period, to get the impression about the premises of a leaner – centered approach of the educational

process (statements EA_1 – EA_4), and (b) the perception of the teachers' role (statements EA_5 – EA_7).

As general remark, the students declared a low level of experiencing behaviors that fit into the student-centered learning approach, with slight differences between the two groups: the average score of 0.19 for all respondents and 0.25 for the CS group and 0.12 for the ENG one. In the case of statement EA_2 (Fig. 5), where the time management ability was put into discussion, all students (on average) registered a slight negative score. This value can be corroborated with their high perception of overwhelming due to work load (statement S_4), with the perception of low involvement in different activities (statements H_2 and H_3), and also with perception of on-line learning as providing a flexible learning opportunity (statement EA_4).

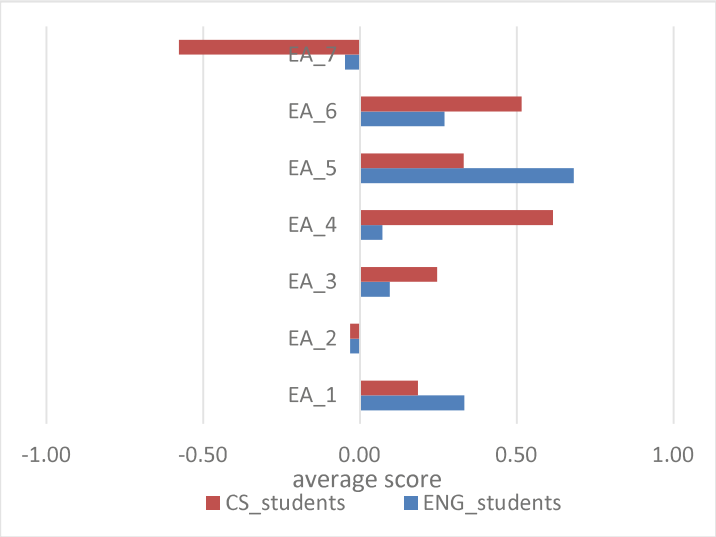

Fig. 5. Students' responses regarding the perception of the educational approach during the on-line learning: EA_1: During the two months of learning online, I learned to be more responsible for my own learning; EA_2: During the two months of online learning, I learned to better organize my study time; EA_3: During the two months of learning in the online system I had moments of reflection, of self-knowledge; EA_4: In general, I believe that the great advantage of learning online is that I can (or could) learn at my own pace, without being constrained by a certain time interval; EA_5: I received feedback from most teachers when I had tasks to solve, and this helped me in learning; EA_6: After the online learning experience I realized that the teacher can offer me support for learning in different ways, not just through face-to-face activities; EA_7: After the experience of online learning, I realized that the teacher is the only one who can tell me what to learn

For the CS students a higher level of on-line learning appreciation as learning in own pace opportunity was registered, compared with the ENG students. This significant difference might be caused by the pedagogical approach of the courses they attended.

Considering the teachers' role perception, differences between the two respondents groups are registered. All students appreciate the role of the teacher in supporting the learning process (Fig. 5, statement EA_6). The CS group of students are more independent in learning, as they had significant lower level of assessment of the statement focusing on the teacher-centered approach of the instructional process (EA_7). A value close to the neutrality was registered for the students form the ENG group, but this came from the balanced distribution of the scoring, revealing differences between students' opinion, most probably caused by the different experiences they faced.

For the ENG group the role of feedback for the teacher was highly appreciated (statement EA_5, Fig. 5), which reveal the appreciation of the supportive role of the teacher.

The Perception of Future Teaching and Learning Approach. Considering the students' experience during the crisis situation, their opinion about valuing this experience was assessed. The general opinion is that the on-line learning might be an option (general average score of 0.73 for all respondents, with 0.58 and 0.87 registered for ENG and CS groups). In Fig. 6 scores for each statement are presented, and it can be concluded that premises for transition to (partial) on-line activity exists, even though slight differences are registered between the two groups of students.

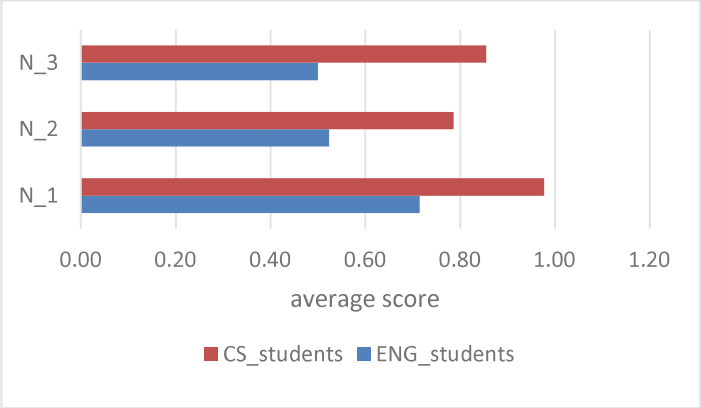

Fig. 6. Students' opinion about the future teaching and learning approach: N_1 I would like to participate in online learning activities, but combined with face-to-face learning activities; N_2 The experience gained during this period can be used in the future, during studies, for online learning; N_3 The experience gained during this period can be used in the future, after graduation, for online learning

3 Conclusions

The present paper addressed the sudden transition to the on-line learning, in engineering studies at undergraduate level. The study focused on the students' perception regarding their experience during the pandemic restrictions, which should be

understood, improved, developed in order to bring an improving step in transition to on-line learning in the future. The majority of the students appreciate the on-line activity, which can be an option for further learning activities, both in the university and in life-long learning context. They possess the basic motivational drivers, such as learning willingness, computer use skills, satisfaction towards studies and a general positive perception of the applicability of their studies in the socio-economic environment. If transition to on-line learning is targeted, it should include the blended-learning option, since the traditional role of the teacher is still appreciated by the engineering students. The computer-science students proved to be more autonomous in learning than the engineering ones, and this issue must be utilized in new instructional design. The negative feelings related to forced on-line experience were identified, but the scores were not very high, driving the idea to propose remedial, supportive activities for students to cope this type of feelings. The results are promising, and the lessons learned from this research will be further used as starting point in investigating perception of actors (as teachers, managerial staff) in order to develop coherent, evidence-based strategy for transition to on-line learning both at course level and faculty level.

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