# Teaching Information Literacy and Critical Thinking Skills in Coronavirus Pandemic Time

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***Abstract.*** *The aim of the research is to demonstrate the author's intention of designing a successful high school freshmen course that can improve students' generic skills and competences needed to empower them on a journey to become valuable contributors of modern society. Even in global COVID-19 pandemic circumstances, when all education went on-line. Whole six-year educational journey is documented and explained through two type of students' surveys, one official, institutional and the authors one, proving some good initial and pandemic Course design decisions. In discussion part some authors recommendations and further challenges are opened.*

**Keywords.** information literacy, critical thinking, teaching, Coronavirus pandemic, freshman course, generic skills

## 1 Introduction

Development of students' generic skills and competencies for better employability and personal prosperity along with primary (ICT) vocation is author's preoccupation since 2012, upon finishing business and starting an academic career.

The idea is permanent empowerment of students to develop or enhance 21st century (generic) skills and related competencies. Skills needed for their University learning environment, and consequently, their (ICT) future in the upcoming VUCA[1] industry 4.0 / digital economy world (WEF, 2015), (WEF, 2016), (Fadel et al., 2015).

With a general lack of conceptual clarity, questions about the classification of generic competencies as domain-specific or domain-general, and whether their development should be within the curriculum or co-curricular and extra-curricular activities. As there are so many of them, very few of them, the ones with great importance for specific vocation fields (like Communication or Creativity) have their own, full course within the academic syllabus.

## 2 Teaching Information Literacy and Critical Thinking Skills Class

In the academic year 2016/17 the author offered the full freshmen course "Information Literacy and Critical Thinking" originally developed for the students of Undergraduate study of Information Technology at Zagreb University of Applied Sciences[2].

It is important to underline that in most developed countries Information Literacy and Critical Thinking Skills learning outcomes are often incorporated into the learning outcomes of a whole study, not just a single class. For example, on a list of The University of Kansas first Core Goal – "Build core skills of critical thinking and quantitative literacy", there are as many as 204 approved courses[3], which would (partially) develop desired generic IL&CT skills, and not one single class with its name. Further on, looking for single classes experience, they are often elective, student orientation courses like the ones in San Diego State University (Harley, 2001), or as a block of two "thought and expression" courses "Advancing critical thinking and information literacy skills" for the first-year college students at Gonzaga University, Spokane (Alfino et al. 2008).

Zagreb University of Applied Sciences decision to dedicate the whole class to the development of students' generic IL&CT skills through teaching dedicated Class, turned into measurable success for at least the first two-generation (Bušelić, 2019).

### 2.1 Coronavirus pandemic online shift

The Class of 2019/20 started on March 2020, at the very beginning of the coronavirus pandemic online class delivery regime in Croatia. The author did not

[1] VUCA is a frequently used managerial acronym explaining attributes of today's world. It stands for Volatile, Uncertain, Complex and Ambiguous.

[2] All design principles of course syllabus, together with first two generations satisfaction and skills improvement surveys are fully elaborated in the 2019 MIPRO conference paper (Bušelić, 2019).

[3] Fulfilling the KU Core, The University of Kansas, https://kucore.ku.edu/ku-core-goals, accessed 7/22/22.

have any online experience teaching so far, so there were many open questions on institutionally allowed course redesign, in line with new circumstances. There was not an option to change learning outcomes, nor general teaching method – project-based learning, but there were a lot of unknowns on appropriate usage of online learning environment.

The basic literature study was from the field of business and HE distance education field (Grandzol & Grandzol, 2006), (Bernard et al., 2004); materials concerning online learning best practices (Keengwe & Kidd, 2010), (Palvia et al., 2018), (Wilson, 2018) and re-reading of some new CT&IL courses practice to better figure out what applies to online environment (Choy, & Cheah, 2009), Weiner, 2011), (Rezaee et al., 2012).

The main difference between graduate students of business education and undergraduate students lies primarily in **motivation** (they are aware of their education cost), and much more already developed skills, like time management, teamwork, ability to work/learn under the pressure, most skills undergraduate students need to develop yet.

On the Lecturer side two most important Lecturer challenges, successfully mastered in a classroom setting, are **the importance of interactivity** and **the ability to critically think himself**, thus able to influence the students.

In a very informative study, with the plethora of cited research on the role of Instructor (teacher) in online and face-to-face Critical Thinking classes "… results indicate that the mode of instructional delivery (face-to-face or online) is not as influential as the **instructor's level of interactivity** in promoting active engagement with course material" (Mandernach et al, 2009).

In an even older, the more cited Case study on teaching critical thinking skills using course content material, not through dedicated class, Thomas Lauer in introductory biology freshmen course "… taught the concept by not specifically identified or labeled critical-thinking terminology in a class. It was not the intent of my study to have students recognize or list critical-thinking components, but rather to improve cognitive abilities from a conceptual viewpoint" (Lauer, 2005). He specifically pinpointed that "… fortunately, we can use critical-thinking skills to teach critical thinking", claiming that if teachers have little knowledge about critical thinking skills; therefore, it is difficult for them to engage students in different activities to develop their high-order thinking skills.

The author of this Course, Lecturer himself, MSc. in Mathematical logic, had no problem with the usage of critical thinking skills to influence the students. They indirectly confirmed in a survey with comments like "*I really like the approach of the professor (through jokes, laughter, interaction …), he explains the topics very well, and along the way, a lot of people* ***wonder about some things****, I have no complaints!".*

Basic Lauer principle, **not to teach students about topic, but simply guide them to learn by themselves** was fully applied, and proved very successful. The author intentionally decided to use "nowdays very popular buzzwords" as Information Literacy and Critical Thinking, making a full course about them, but never explained, mentioned, or "preached/taught" **any other skill** they mastered. This research demonstrated they learned a lot of valuable (generic) skills as a "Class byproduct".

## 2.2 Online environment changes

From an institutional point, each lecturer was able to choose their own online delivery platform and slightly modify assessments. Standard Croatian tools for High Education online education are LMS Moodle and Microsoft Teams collaboration suite. The author immediately picked **MS Teams** with no LMS usage at all. As already pointed out in the literature review recommendations, the primary reason was **collaboration** and **interactivity**.

Another important design factor was **not to record any lessons**, for the same reason. This Course is about **active participation** and **teamwork**, so anyone not able to participate should find their way to update himself through teammates, not video lectures.

PowerPoint presentations, as **class notes, were available** immediately after the sessions, with all other working materials, and all the students were from the beginning divided into (random) teams working on individual project themes. During the Class **MS Teams Team Channels were used**, together with any additional collaboration communication tools students were used to (Slack, WhatsApp, …).

To maintain almost the same learning outcomes, a simple **knowledge test of understanding the theoretical background** of Information Literacy and Critical Thinking **was omitted**, so all the focus could be transferred to **skill practice**. By doing that course design changes, lessons become even more interactive, with **fever lectures** and much **more workshop time**.

To keep **relevance to the present situation,** most the examples were transformed into pandemic context. For instance, the problem of fake news and difficulties to figure out the truth was replaced with a problem to understand the constant **overflooding of COVID-19 related information** and recommendations on what to do, or not to do to stay well and healthy.

Online teamwork was maybe even more suitable than classroom practice because the class could switch in a second to teams' private channel mode, so they can immediately continue working on an **individual task inside each group**, and report back to Classroom mode with no interruption of others.

Keeping interaction and **motivation of a large group** of 50 – 60, up to almost 100 students, online was much more difficult than looking at them directly, instantly responding to any sign of nonunderstanding

or boredom, but manageable, requiring **much more side chatting, commenting, questioning, joking**, **…**

The last design delivery difference was 25-minute uninterrupted sessions with mandatory five-minute breaks, as the author explained and introduced the **Pomodoro learning technique**, teaching them as well some new methods of learning.

According to mandatory student class feedback, which is conducted at the beginning and after the end of every class, the author was satisfied with overall Class feedback and continued to deliver it for two more generations with really **minor changes**.

# 3 Research

This research aims to confirm the author's intention of designing a successful high school freshmen course that can improve students' generic skills and competences needed to empower them on a journey to become valuable contributors to modern society. Despite severe pandemic circumstances which affected the society, high education, students and teachers themselves[4].

## 3.1 Methodology

To understand student's attitudes towards the Class **two surveys were conducted**. The first one is an institutional, official survey, each student has to fill at the beginning and the end of each semester, and the other is created by the author to get additional, more insightful information about the Class and acquired and/or improved generic skills.

The second one, the **author's unannounced survey**, was performed in the period from 2nd to 7th of May 2022, for all three "pandemic" generations. As the Class finished more than half a year, or even two and a half years ago, and as the author did not have any contact nor he will conduct any class till the end of their study, students were not biased at all. They just recollected their thoughts about the things they have learned quite some time ago.

The survey was the same as described in (Bušelić, 2019), with additional four questions concerning pandemic situation. It reached 201 students out of 205 who completed the Course (four of them left the University), and got an exceptional return rate of 48,26 % answers (97 out of 201). Ten of them were invalid, and nine more were uncompleted, so there is a 43,28 % return rate (87 out of 201).

This sample size gives a confidence interval of 0,08, with std. error of 0,04, within a confidence level of 95%. Even year by year samples of 31,36 and 20 answers (37,80% for 2019/20, 55,38% for 2020/21 and 37,04% for 2021/22) within same confidence level of 95% are acceptable. Confidence interval for each year is 0,14; 011 and 0,18 with std. error of 0,07, 0,06 and 0,09. That validates conclusions performed for insight made for each pandemic generation as well.

Survey repeated the exactly the same set of questions as already published analysis of Classes of 2016/17 and 17/18, with methodology and results publicly discussed on 42 International Conference MIPRO and published in IEEE Proceedings, ensuring from the field experts' side that survey does not contain a common type of errors like leading, confusing or double-barreled questions. In its afterlife, according to the Google Scholar, the article is cited 7 times, and according to the authors ResearchGate page was downloaded and acknowledged more than 300 times, with no expert objections or comments on methodology.

The high level of reliability and internal consistency of the main 20 skills questionnaire presented in Table 1. (Improvement of skills and competences after the Class) is confirmed by Cronbach's Alpha coefficient of 0,962.

The other survey that is used in this research is an **official, the institutional survey** that is performed at the beginning and the end of each class, so all institutional classes and lecturers can be compared. It has two groups of questions: about topics of a course and lecturer performance. At the beginning of each class, 14 questions are asked - 10 about the class and four about the lecturer. At the end of each class, 27 questions are asked: 18 about a Class and nine about lecturer. Scale is classical school grading (1 – 5). For this research 13 selected questions from the end of class, survey are used to analyze students' satisfaction and comparison with other classes during their study – eight about the class and five about the lecturer[5].

Although both surveys are mandatory, students can fill in the blanks, so there is an usual low return rate. The return rate for class 2019-20 was 54.65 % (47 out of 86 students), for 2020-21 was 61.54 % (40 out of 65) and for 2019-20 only 31.48 % (17 out of 54 students).

# 4 Results

In this Chapter findings of the institutional "End of Class survey" and author's "Student's improvements survey" are given together with a comparation of "pre-pandemic" and "pandemic" generations results.

## 4.1 End of Class Institutional survey

The comparison of students' satisfaction with a Class vs. average satisfaction with a whole Study, prior to and during the pandemic, is given in Fig 1.

[4] This research should be interpreted as an extension to (Bušelić, 2019) research, showing that even in pandemic circumstances Information Literacy and Critical Thinking online class can bring substantial value to students.

[5] Questions selected for this analysis are processed in Fig. 2.

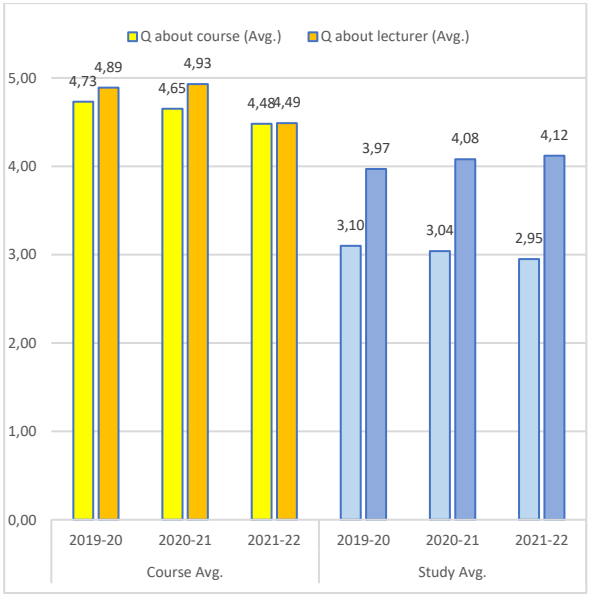


**Figure 1.** Official student's Avg. Course performance satisfaction survey with Study Avg comparison.

It is clear that the overall Course average is much higher than the study average (4,62 vs. 3,03), and Lecturer satisfaction is also significantly higher than the satisfaction of all lecturers (4,77 vs. 4,06), although lecturers are rated much better than study (4,06 vs. 3,03).

The average score for this analysis is calculated out of 13 selected questions from the institutional, mandatory survey. Eight are about topics and five are about a lecturer. When looking at Fig 2. - individual question Class averages, it is visible that all grades are in an upper range, distributed from 4,2 to 4,95 (4 questions in 2020-21), with the obvious drop in the third year (2021-22) - minimum scores for each question.

This visible drop in students' Class satisfaction in 2021-22, is a very good indicator of their exhaustion from the pandemic situation.

## 4.2 Student improvements survey

As official students' satisfaction study intention is not to go into the actual topics of each class, to understand their attitude towards this Class, especially during the pandemic time, the author conducted the same survey as in 2019, with more details, looking for their personal improvement of most important skills and competences acquired during the Course.

As in the class, the majority of students were male (81,52 %), with little more (50:42) students with general (gymnasium) than the vocational backgrounds. Majority of them (69,57 %) are 20 – 25-year-old. Majority (59,79) are very good graded students, 26,09% good and 14,13% excellent. Most of them (76.09 %) are regular students, but only 26,09% have no working experience. The rest of them are either temporary working or full-time employed.

The survey structure is simple: after asking them one simple open question **"Have you learned something useful during the course?"** with one-third (33,33%) answered No, the rest of them **elaborate on what it was**. There were 44 individual answers (78,57% response rate) and most of the answers will be presented during the discussion part, right after the structured part of the survey.

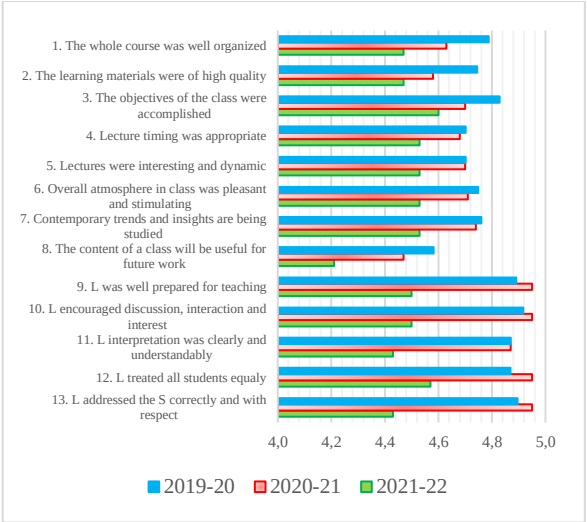


**Figure 2** Selected 13 questions, comparison for a three-year period

### 4.2.1 Pandemic influence

The only difference between the 2019 survey was **four questions concerning pandemic influence.** The three questions were Likert 7-point agreement scale about their experience with their individual external and internal circumstances plus their relation/treatment of this Class:

ExtQ: *My external environment (everything that surrounded me during the pandemic – the general public, work, family, friends, working conditions, college, ...).*
The overall external corona pandemic situation (objectively or subjectively) I found myself in was:

IntQ: *My inner state (everything that happened to me, how I felt, behaved, acted, worked, ...).*
My state (how I personally coped) during the crown of the pandemic was:

The scale went from (1) Extremely negative (stressful), (2) Very negative (very disturbing), (3) Quite negative (often in a state of anxiety), (3) Neutral (as usual), (5) Extra motivating (sometimes), (6) Increased motivation (quite common), to (7) Extremely motivating (almost constantly, kind of positive stress).

ClassQ: *Situation related to this particular course*.
If you would compare your attitude/commitment/work in classical, live teaching and the situation we worked on (completely independent of the situation, looking back objectively), please evaluate YOUR personal relationship/ contribution. It was:

The scale for the Class experience was a little bit different, but also spread from a negative to a positive range: (1) Minor (I didn't really care), (2) Ignoring (to be done, if have spare time), (3) Reduced (fulfill obligation, get a grade), (4) Standard (attended, listened, worked as usual), (5) Increased (spend more time, read/worked more), (6) Excited (looking forward, engaged), and (7) Delighted (happily waited for, extra work/read).

At the end of this block, there was an **open comment section about education in a pandemic situation** or any personal remark, so they can elaborate if wanted. There were 41 (47,13%) very valuable observations, the author will take into consideration for Class improvement.

Most answers stand out online benefits like no travel time (students living out of Zagreb) and/or no problem with working schedule (3 out 4 are working, fully or temporarily), and on the negative side No.1 was lack of interaction with colleagues and professors, followed by lower quality of practical work during mandatory exercises. Most of them pointed out that according to the circumstances the study was well organized.

Upon looking at student's relationship with the Class in time, two things can be seen from the distribution of answers to ClassQ:

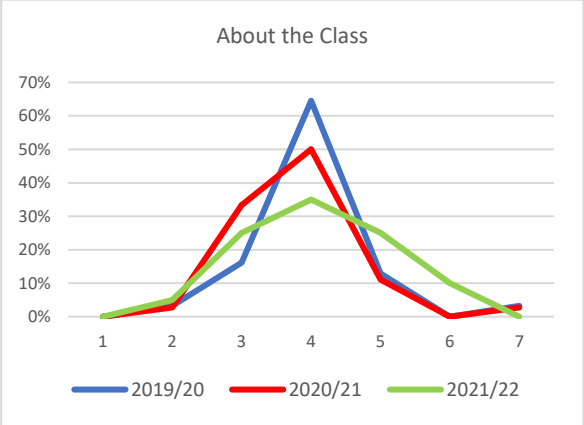


**Figure 3.** Class question, distribution by year

Distribution is quite normal, flattening the top as time goes by, with a slightly lower attitude in the second year and slightly better in the last one. As if they had adapted to the situation.

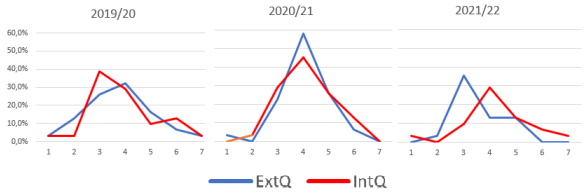


**Figure 4.** Yearly distribution of student's external and internal experience

Their relationship toward pandemia is even better visible though comparison between external (difficulties like pandemia, earthquake in Zagreb at the beginning of 2019/20 class) and internal state. Average of classes for internal state went positive from 3,90 to 4,14 and 4,25, but for external circumstances after 2020/21 consolidation went down again – from 3,77, 4,06 sharp drop to 3,55, showing that most of them considered the third year of pandemia even worse than initial pandemia plus earthquake.

### 4.2.2 Skills improvement and importance

Survey continues as previous one with simple open question "**Have you learned something useful during the course?**". And if any, **what it is**? This time exactly one-third of them (surprisingly) answered "No"[6], and out of 56 "Yes", 40 of them (71,42%) elaborate what it was in an open form, with their own words. Most of "Yes" elaboration will be commented on during the discussion part, right after the structured part of the survey.

After this free-form comments of what they have learned, they were just asked a question to **choose the area of their life they improved the most**: faculty, family, friends, work, personal development, all of the above or none. Most of them (36,90%) attributed it to the area of personal development.

In the structured part of the survey, they were offered a list of 20 skills and competences to grade them according to criteria "**Evaluate how much you have developed and improved your skills and competencies during the course:**"

Criteria was Likert 7-point agreement scale coded from (I) not at all, (II) very little, (III) little, (IV) average, (V) above average, (VI) very much, to (VII) extremely.

**Table 1.** Improvement of skills and competences after the Class

| **Skills and competences** | I | II | III | IV | V | VI | VII |
|---|---|---|---|---|---|---|---|
| Taking the stance/attitude | 3 | 3 | 8 | 14 | 23 | 18 | 9 |
| Critical evaluation of stance (own incl.) | 3 | 1 | 12 | 19 | 17 | 18 | 8 |
| Responsibility | 2 | 4 | 7 | 23 | 20 | 14 | 8 |
| Result orientation | 4 | 2 | 10 | 21 | 14 | 21 | 6 |
| Adaptability | 3 | 5 | 6 | 23 | 23 | 12 | 6 |
| Argumentation | 3 | 3 | 12 | 14 | 29 | 14 | 3 |
| Information presentation (ppt & seminar) | 2 | 5 | 14 | 18 | 19 | 13 | 7 |
| Communication | 2 | 8 | 6 | 25 | 16 | 15 | 6 |
| Awareness of information need | 2 | 2 | 10 | 29 | 19 | 12 | 4 |
| Openness | 4 | 4 | 11 | 19 | 21 | 13 | 6 |
| Self-criticism | 2 | 7 | 9 | 26 | 15 | 10 | 9 |
| Teamwork | 2 | 9 | 8 | 25 | 13 | 14 | 7 |
| The influence of emotion on attitude | 5 | 4 | 10 | 21 | 24 | 7 | 7 |
| Logical component of argumentation | 5 | 1 | 11 | 23 | 26 | 9 | 3 |
| Idea and formulation | 2 | 6 | 12 | 22 | 24 | 10 | 2 |
| Persistence | 5 | 3 | 14 | 24 | 17 | 12 | 3 |

[6] Author could not identify any correlation between answer "No" and their gender, age, education or working relation.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Learning by participation | 4 | 9 | 11 | 25 | 15 | 8 | 6 |
| Tools (Mind mapping) | 6 | 8 | 11 | 22 | 20 | 7 | 4 |
| Information evaluation (CRAPP method) | 7 | 7 | 14 | 19 | 16 | 13 | 2 |
| ERR learning method | 4 | 13 | 10 | 27 | 11 | 8 | 5 |

The results are sorted out according to most developed or improved skills and showed progress in all 20 skills covered in this questionnaire. Even last three have shown average development / improvement (4,01; 3,99 and 3,92). Upon looking at overall extremes, it is exactly 2,06 times more (VI) very much and (VII) extremely answers than (I) not at all and (II) very little.

After this, a simple check box criterion is offered to them: "**Out of all the above-mentioned features, select a few (5-10) of the ones that you personally consider being the most valuable and which you believe are important for the next generation of students**". Before the list, a comment has to be made, that in average they pointed out around eight skills each (8,27), proving a point that they learned a lot of very valuable skills. A list of top 10 acquired skills, all mentioned from more than a half of students, is given in Table 2. The percentage is calculated as percentage of students nominated particular skill in an arbitrary group they believe are most valuable.

**Table 2.** Most valuable acquired skills according to student's recommendation

| # | Top Skills | % |
|---|---|---|
| 1 | Responsibility | 67,95% |
| 2 | Taking the stance/attitude | 62,82% |
| 3 | Critical evaluation of stance (own incl.) | 57,69% |
| 4 | Argumentation | 57,69% |
| 5 | Teamwork | 57,69% |
| 6 | Awareness of information need | 51,28% |
| 7 | Communication | 48,72% |
| 8 | Self-criticism | 48,72% |
| 9 | The influence of emotion on attitude | 39,74% |
| 10 | Persistence | 39,74% |

The number one skill on the list is Responsibility. This means that it was selected/recommended by 53 out of 78 students. So, most of them think it is important, and as it was 3rd on the previous list (of skills they learned or improved) it is pretty much clear they consider it important, but more important is a learning process per se. During a Class, there was no single lecture on responsibility, so obviously students themselves learned its importance by fulfilling set obligations. This is the same with the first three skills on this list, but the other two were much more mentioned during Class.

Comparing these two tables is interesting in the position of "Result orientation", skill No.4. of skills they mastered. Although obviously their very important learning, they do not consider recommending it to others (No. 16 with just 30,77 %, or 24 recommendations on this list). The opposite situation is with "Teamwork", a skill they would definitely recommend (57,69 %, No. 3 on a list). It is not high on the list of skills they mastered, only on 12th position. Probably because of online environment.

#### 4.2.3 Student's comments and impressions about the Class

Survey had two open questions from which student's attitudes towards the Course can be elaborated.

The first one was already mentioned, a question about what they learn, they found useful. Even some (4) "Nothing" answers had explanations, like this one saying "*… not really nothing, but most of the stuff I already know …*", and one very valuable insight – "*My task was very simple, so I did not learn much*", explaining that some students (because of online environment) just did "their" homework and never joined a team, helping others, learning from them, and their tasks, as well. This is a typical downside of online learning environment, difficulty to get all students on the same page.

Of course, there were many more "Yes" elaborations (40), just to mention typical ones: "*Better organization in work and division of work in the team*", "*I learned some important things regarding not only checking information but also how to use various information in general. This is exactly what I consider important for personal development and as something that will help me in life*". And a favorite one, right to the point: "***I learned to think differently***".

At the end of the survey, there were much fewer comments (**about anything they wanted**), but the general message was they were sad the Class was not conducted live. It is obvious they almost could feel the benefits of interaction. And if needed to quote one, the most representative wrap-up would be; "*I honestly don't remember the details of the course, and those two years during the pandemic are a black hole in my memory, however, I have some key moments that have remained imprinted on me from your lectures. I think the way of working on the course is great. From teamwork, the random selection of teams, answering questions, and giving our own opinions at the lecture as if we were on a "friendly coffee", but instructive. You break our comfort zone and allow students to get to know each other and socialize with people they might never communicate with*".

## 4.3 Comparation of "pre-pandemic" and "pandemic" surveys

Despite pandemia and earthquake in Zagreb, online way of work for a class which was designed as highly interactive, official student satisfaction survey results are even higher. Although results of the 2018/19 generation are not published in the previous article, the author extracted results from University records, to be

able to compare sat of three generations – the first three were conducted regularly, as designed, and the last three were educated on-line.

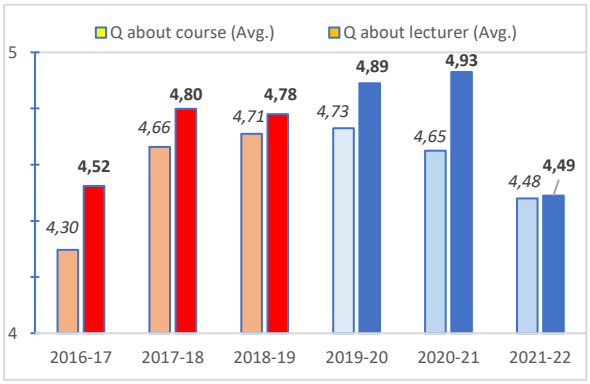


**Figure 5.** Comparison of Course and Lecturer grades

During pre-pandemic years Course average was 4,56, and improved to 4,62. Lecturer grade shows similar improvement: from 4,70 to 4,77. So, despite pandemic circumstances, both Course and Lecturer got better grades from students.

Out of comparison of the pre-pandemic and pandemic improvement skill lists, shown in Fig. 6, it is obvious that there was less enhancement/improvement during pandemia (overall average dropped from 4,84 to 4,38). Apart from two top skills ("Taking the stance/attitude" and "Critical evaluation of stance (own incl.)" pandemic generation also significantly improved in "Responsibility", "Result orientation" and "Argumentation" which is different from their improvement in pre-pandemic environment, probably because of new circumstances.

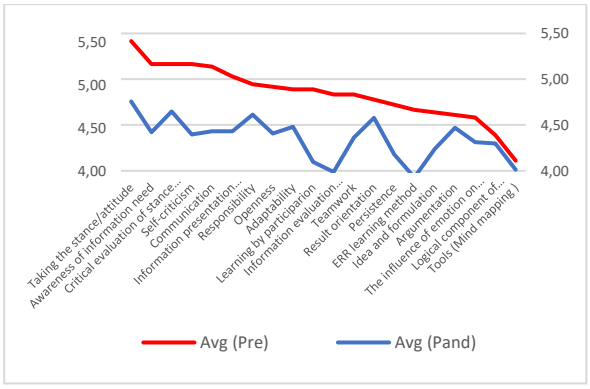


**Figure 6.** Comparison of skills improvement

On a list of the most valuable acquired skills (Table 2.), top five post-pandemic skills are also in top five of the pre-pandemic survey: 1. "Responsibility" (pre-pandemic rank as 5.), 2. "Taking the stance/attitude" (2.), 3. "Teamwork" (1.), 3. "Critical evaluation of stance" (2.) and 3. "Argumentation" (5.).

# 5 Discussion

As this Class is about developing skills for future ICT experts, it is important to discuss anything that can improve it, but also to raise some general questions/ recommendations author experienced in effort to teach students to think on a higher cognitive level (meta-thinking).

## 5.1 Results

The overall result of the Institutional survey showed that students liked (graded well) both the Course and the Lecturer as well, despite the pandemic sort of depression and online environment. Their grades are even better than in the pre-pandemic period.

The authors skills improvement survey well-explained the pandemic situation they went through, with their mostly positive coping with pandemia and earthquake, but kind of "depression" in the third year. Despite that they learned a lot and liked the Course.

In the same survey they confirmed the valuable contribution of the Class in developing/enhancing as many as 20 skills, which proves not only enhancing Critical thinking and/or Information literacy but a wide area of skills improvement. Obviously, they did not enhance those skills to full potential like their predecessors who had "a classic", interactive classes.

So, the obvious consequence is that although a lecturer can conduct a successful course in on-line, pandemic environment, for obtaining better, deeper improvement of skills face-to-face classroom is much better.

## 5.2 Online improvements

Upon writing the article, students are released back to classrooms, much more interested in open communication with us, online education went back to normal usage (if any), but as we never know what the future brings or some of us will combine classroom and online teaching. The author fully agree with a quote from Nature magazine: "Paths for greater access and opportunities to online education have now been forged, and there is a clear route for the next generation of adopters of online education" (Lockee, 2021). For anyone eager to plan any online education, this short paper offers 19 relevant references to start from.

The author, who was never fond of online/LMS educational methods, is definitely encouraged by this experience, so is considering at least usage of flipped classroom approach. It is ideal for the introduction of basic Information Literacy and Critical Thinking concepts and definitions as described in detail in (Divjak, 2022). By doing just that part, at the very beginning of a Class, even greater student engagement is expected.

### 5.3 Area of skills

Area of skills is slightly different from the list of ten most important skills Croatian ICT employers require from HE (Aničić & Bušelić, 2020), but not very far from that either. Especially "Ability to work in teams", "Analytical thinking" and "Taking responsibility". That means that by carefully designing topics, themes, and especially assignments, the lecturer can with more or less success select and improve a very specific set of skills. Not one skill, per se, but the whole family of them.

At the very end of the general points for further discussion, the author found the inspirational and valuable concept of Four-dimensional education for sustainable societies (Fadel & Groff, 2019) confirming that this Class is **adaptive, flexible, and balanced** as recommended. "While the curriculum must able to adapt to a rapidly changing world, it also must be able to be flexible to individual learner interests, needs, and goals, as well as local needs at the classroom and community level". And balanced as well, covering topics of "... humanities, science, technology, engineering, and mathematics (STEM)", not falling as "victim to a mindset of false choices, such as: "Which is better?"—teaching knowledge, or teaching skills?".

We can, and we should teach them both, as early as we got them in their educational journey!

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