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Enhancing Analytical Thinking in Tertiary Students Using Debates

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Abstract: The purpose of the study was to identify how debates effected the analytical thinking abilities of tertiary students and how the debates as an instructional approach were perceived by the students. The study used quantitative data collection methods such as tests and observation checklists and qualitative data collection methods such as a focus group discussion. The data was yielded from the measurements of students' analytical thinking, critical thinking, problem-solving skills, and decision-making skills. The pretest and posttest measurements were administered using the test of analytical skills, the quiz entitled "Get Ready to Test Your Analytical Skills!", and the problem-solving test. The study found that the debates improve the students' analytical thinking abilities and are perceived positively by them. The pretest and posttest measurements results, observation reports, and a focus group discussion showed that the debate-driven instructional model brought positive change to students' analytical thinking, critical thinking, problem-solving skills, and decision-making skills which are supported by the statistically significant Mean differences in all the variables. The findings from observations implied that the lessons were organised in a way that could sufficiently challenge the students, engage them in the search of information, and presenting their findings based on the facts and statistics. The results obtained from the students' responses in the outline focus group discussion found that the students appreciated participation in the debates as they associated the experience with job benefits, the practical value of the debates, learning engagement, and research.

Keywords: *Higher education, analytical thinking, debates, reshaping the curriculum.*

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Introduction

The debates are proved to be an efficient instructional tool to develop analytical thinking abilities in tertiary students (Bacikova, 2018; Nurakhir et al., 2020). This opinion is supported by the statistics drawn from the higher-order thinking tests (Bacikova, 2018; Nureldeen, 2020). It relies on the idea that debates, as the collaborative learning environment, seem to have more potential in students' intellectual development than individual learning. Debates require preparation through doing research and these serve an efficient challenge based on processing, synthesising, summarising evaluating, structuring, and conceptualising plentiful information (Montanes et al., 2020; Nureldeen, 2020). Analytical thinking abilities are usually associated with critical thinking abilities because the process of conceptualizing information may be followed or preceded by an evaluation of its relevance, quality, and appropriateness (Critical Thinking Secrets, 2020). The debates address the issues of the dominance of teacher-centered methodologies in the curriculum of universities (Nureldeen, 2020). The analytical and critical thinking components, though claimed to be crucial ones in learning, are underestimated in Ukraine by both institutions and educators (Astafieva et al., 2019; Bobrytska et al., 2020). It was also found that the development of analytical thinking in tertiary students using debates to be underrepresented in the literature which created the gap for the study.

Literature review

In the literature, analytical thinking is defined as the integrated ability that combines the elements such as search, selection, and categorization of the relevant data and information further presenting it through infographics;

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identification of the most likely cause(s), and logical outcome(s) of the problem; the suggestion of the solutions or alternative approaches to resolving complex problems based on cross-disciplinary findings from multiple sources and conclusions drawn from the data which is followed by evaluating of those solutions and making the decision(s) on the most effective one(s) in preventing the problem from taking place either partially or totally (Chicago State University, 2020; Irwanto, 2018). The above implies that the key components of analytical thinking are in-depth search, data analysis and evaluation, problem-solving, and decision-making. The outlined components are essential learning experiences as these are related to reasoning, planning and conducting a learning inquiry process, interpreting the yielded data and findings followed by drawing conclusions (Yulina et al., 2019).

The examination of the theoretical sources found that the higher-order thinking skills are developed in learners by instructional models that are based on the constructivist theory (Sartika, 2017). These instructional models are as follows: a model of guided inquiry, a Problem Based Learning (PBL) model, a group investigation model, Context-Based Learning (CBL) model, a model based on the strategy of Mood, Understand, Recall, Digest, Expand, Review (MURDER), the 4A learning models involving analysis of a phenomenon, analysis of information, analysis of data, and analysis of findings, and an infographics-based learning model (Yulina et al., 2019). Despite being different in focus, all the above models are intended to create a learning environment for the students to enhance their reasoning ability, the skills of planning and conducting a learning inquiry, and using knowledge already gained. These also make teaching more systematic.

Debates have been proved to foster reasoning and higher-order thinking skills when used in the educational process (Walker & Sampson, 2013). This was also found in the research revealing theoretical and methodological aspects of using debates in education and vocational training (Abernathy & Forestal, 2019; Ang et al., 2019; Wilson & Brown, 2016; Toner & Woolley, 2016).

Brownson (2013) opines that debates are more effective than conventional instruction strategies. Four formats for debate are practiced in tertiary school because these develop the students' higher-order thinking abilities. These are as follows: Lincoln-Douglas debate, Cross Examination Debate, the academic debate, and Parliamentary debate (Sadler, 2010; Williams-Brown, 2015). Lincoln-Douglas debate is an instructional tool that is used to raise students' awareness of domestic social and economic issues, to foster the feeling of citizenship and belonging in the students through engaging them in working out the solution to some problem that is significant to the community. Cross-Examination (or Policy) debate fosters students' analytical and critical thinking, fosters the skills of listening and building arguments together with research skills and advocacy skills. The academic debate is used in the institutions as a learning environment that engages students in knowledge sharing and decision-making on matters of public interest. It develops students' confidence, analytic and critical thinking, and soft skills.

It was found that the Parliamentary Debate format had been the most widely used at the universities. The reason for this is that this format aims at not only involving students in argumentation but also in proposing a course of action and supporting it with philosophical, practical, and consequential arguments (American Parliamentary Debate Association, 2020). It means that students should apply both analytical thinking and problem-solving skills. However, there was found that the development of analytical thinking in tertiary students using debates is underrepresented in the literature which created the gap for this study.

Therefore, the purpose of the study was 1) to identify whether how debates effected the analytical thinking abilities in tertiary students; 2) to identify how the debates as an instructional approach were perceived by the students.

The research questions are stated below.

1) to identify how debates influenced students' analytical thinking and problem-solving skills.

2) to examine how the sampled students perceived the instructional model based on the Parliamentary debates.

Methodology

The study used quantitative data collection methods such as tests and observation checklists and qualitative data collection methods such as a focus group discussion (Schoonenboom & Johnson, 2017). The data was yielded from the measurements of students' analytical thinking and problem-solving skills. The measurements were administered before and after the intervention and were based on 1) the Test of Analytical Skills (TAS) (3SmartCubes, 2020); 2) the Quiz entitled "Get Ready To Test Your Analytical Skills!" (ProProfs Quizzes, 2020) to monitor analytical thinking; and 3) the problem-solving inventory to monitor change students' problem-solving confidence, their approach-avoidance style, and personal control that was adapted to fit Ukrainian context (Soliman, 2014). The observations were performed and the focus group discussion was held to receive verbal feedback about the usefulness and instructional effectiveness of the intervention.

Research design

The study relies on one group pre-test- post-test design of a quasi-experiment (Price et al., 2015). The research procedure included five basic phases such as a conceptualisation, research design, and materials design, intervention, data analysis, and interpretation followed by dissemination (Hanacek, 2010). The conceptualisation phase was dedicated to the specification of the research scope and feasibility of the intervention. In the research design and materials design phase, the research instruments were selected and validated, the research and sampling plan was designed. During the intervention phase, the pre-, while (observation), and post- measurements were administered, and the data were collected. Following that, the data were consolidated, analysed, and interpreted. In the dissemination phase, the recommendations were produced and shared with the colleagues (see Figure 1).

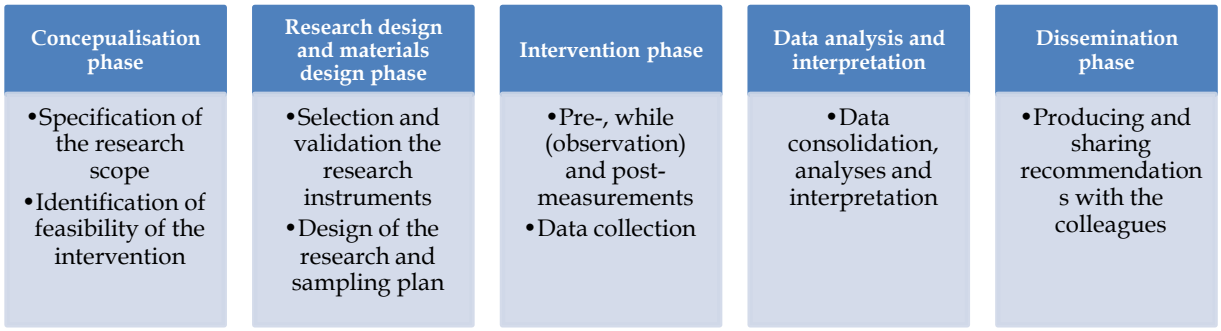

Figure 1. Research procedure outline based on five phases

Description of the intervention

The curriculum in the International Economics course (6 ECTS, 180 hours) was reshaped to shift from the conventional lecture-based delivery to the debate-driven instructional model. The intervention was organised as a multidirectional influence including training sessions in research and analysing techniques, persuasion techniques, debating techniques, the use of logical fallacies, skills of solving the problems accompanied by making augmented decisions based on the research and statistics proven premise. The online community entitled "Debate It Now" was created as the environment and platform for sampled students to cooperate and debate the economy-related issues in Ukrainian and the world along with gathering and sharing their insights, research, and viewpoints through collaboration.

The private Telegram group was created to engage and manage the students. The Telegram Like Bot was used to poll the students and decide on the topic for the debate. The Quiz Bot was used to design and deliver different quests. The Logic Like apps (available at https://logiclike.com/en) was employed to impose additional cognitive load through training logic, analytical and critical thinking. The Cisco Webex web conferencing application was utilised to run the training activities and debates.

The students were delegated to formulate the vision and mission statements for the community, develop the schedule of training and debate sessions, assess peers, to make adjustments to the content and structure of the course.

The topics were as outlined below.

1. Should monetary and fiscal policy be reshaped to address the stabilization of the world economy?

2. Should the expenses on governments be reduced in the budget of Ukraine?

3. Should the tax laws be reshaped to stimulate personal savings?

4. Should the tax rate be progressive or regressive in Ukraine?

5. Should it be attempted to democratise states through engagement, free trade, and conciliation or by the use of punitive sanctions and belligerence?

6. Will free trade benefit developing countries and harm developed countries?

The debates relied on the parliamentary format (American Parliamentary Debate Association, 2020). The schedule and time format are listed below. Optionally, the teams could be given two minutes to prepare arguments for the next debate stage.

- First affirmative constructive (7-8 minutes)
- First negative constructive (7-8 minutes)
- Second affirmative constructive (7-8 minutes)
- Second negative constructive (7-8 minutes)

- Negative rebuttal (4-5 minutes)
- Affirmative rebuttal (4-5 minutes)

Sampling

The sampling was based on the implications of Doody and Condon (2012), Wilson and Brown (2016) stating that the sample of 16 learners and 25 students, respectively, was a manageable and sufficient sample size to train students in debating. Given the above and quasi-experimental design of the study, the convenience sampling technique was applied to involve 22 (14 males aged 21-22 and 8 females aged 21-22) undergraduates majoring in International Economics for Kyiv National Economic University named after Vadym Hetman in the experiment. Though considered homogeneous because they sought the degree in the same major, sampled students were additionally tested for homogeneity in the qualities under the research, using the test of analytical skills (TAS), the Quiz: Get Ready to Test your Analytical Skills! (QGRTAS), and the problem-solving inventory (PSI).

The cumulative Grade Point Average (G.P.A.) was calculated to identify whether the students' English language fluency was sufficient to understand and answer the statements in the instruments. The CPA was higher than 75% (ECTS) which was considered high enough for the students to do the tests.

Instruments

Seven instruments were used to draw the data throughout the study. These were as follows: the Test of Analytical Skills (3SmartCubes, 2020), the Quiz entitled "Get Ready to Test Your Analytical Skills!" (ProProfs Quizzes, 2020), the Problem-Solving Inventory (PSI) that was adapted to fit the Ukrainian context (Soliman, 2014), the observation reports, and the focus group discussion questionnaire. The data were analysed using the IBM SPSS Statistics 26.0. statistical software and the Voyant Tools (can be accessed via https://voyant-tools.org/).

The Test of Analytical Skills (TAS)

It relies on 12 situations with 12 multiple-choice questions (3SmartCubes, 2020). The supposed time limit to take it is 4 minutes. The test uses 12-grade system to interpret the results with 1-4 = "poor", 5-8 = "good", 9-10 = "average" and 11-12 = "excellent" analytical skills. The test was validated by a total of six experts - three experts with a Ph.D. degree in IQ and aptitude testing and three experts with Ph.D. in Pedagogics.

The Quiz: Get Ready to Test your Analytical Skills! (QGRTAS)

The quiz is similar to the above test in question types and structure (ProProfs Quizzes, 2020). It also consists of 12 situations with multiple-choice questions. The quiz uses the 100-point 'pass-fail' assessment system. The test is considered to be passed if the score is higher than 80. The quiz was also validated by six experts in IQ and aptitude testing and Pedagogics. They also validated its construct and content validity through judgements that were further consolidated and used to calculate the Average Congruency Percentage (ACP) for each question. The values for ACP were between 0.93 and 0.95 and were greater than 90% which indicated the strong validity of questions (Xi & Sawaki, 2016).

The Problem Solving Inventory (PSI)

A 27-item inventory was borrowed from Soliman (2014) and slightly adjusted to the Ukrainian context. The inventory is organised into three factors as a Problem-Solving Confidence, an Approach-Avoidance Style, and a Personal Control. The Problem-Solving Confidence section consisted of 14 questions, the Approach-Avoidance Style section comprised 7 questions. The Personal Control included 6 items.

The Checklist for Observation Reports (Appendix A)

The checklist consists of 7 general questions to cover the components of analytical thinking. The observers were supposed to use a Likert 4-point rating scale with 1 meaning 'poor', 2 = 'average', 3 = 'good', 4 = 'excellent' to express their impressions. Following that, the observers wrote an observation report. The Voyant Tools were used to analyse them.

The Focus Group Discussion Questionnaire

Nine randomly selected students were hired to participate in the 50-minute online discussion run through the Zoom videoconferencing platform which was also employed to record the discussion. It was based on a 4-stages approach combining the opening stage, warm-up questions, moderated discussion stage, and a concluding stage. The recorded responses were transcribed and analysed. The Voyant Tools were used to analyse the corpus of the responses to the first question. The answers to other questions were coded, consolidated as an Excel file, and analysed manually.

Questions

1. What were your attitudes towards the use of debates in your studies? If negative, how those could be rectified?

2. What changes in the way you process information have you experienced due to debates? What drove your positive or negative changes?

3. Do you think debates improve students' analytical thinking abilities such as the specification of a concept or problem, dissection of its elements, organisation of information for making a decision, evaluation, and drawing conclusions from it?

4. How could the way the debates were used be improved to make this activity more useful for the development of your intellectual potential?

Data analysis

The quantitative data were drawn from the Test of Analytical Skills (TAS), the Quiz entitled "Get Ready to Test Your Analytical Skills!", the Problem-Solving Inventory (PSI). The qualitative data were drawn from the focus group discussion. The TAS was intended to identify how effectively one could use and draw the inference from new information. The QGRTAS was used to monitor the change in students' analytical thinking abilities. The PSI attempted to monitor a change in students' problem-solving confidence, their approach-avoidance style, and personal control. The TAS was evaluated by experts for readability, clarity of wording, layout, and style, and feasibility of the test. The expert judgements were used to evaluate the construct and content validity of the test. The Average Congruency Percentage (ACP) was computed to identify whether the questions were deemed to be relevant to them. The values for ACP were between 0.95 and 0.97 which were greater than 90% and indicated the strong validity of questions (Xi & Sawaki, 2016). The PSI was validated by Soliman (2014) with the alpha total coefficient of .75, and value of .88 for Problem Solving Confidence section, .82 for Approach-Avoidance Style section, and .76 for the Personal Control section. The values for intercorrelations among the factors were as follows: for the Problem-Solving Confidence ↔ Approach-Avoidance Style correlation, it was $r = .30$; for the Problem-solving Confidence ↔ Personal Control correlation, it was $r = .55$; and for the Approach-Avoidance Style ↔ Personal Control correlation, it was $r = .60$. The inventory was reported as a reliable instrument (Soliman, 2014).

Results

The study results are arranged in three sections to respond to two research questions. The pretest and posttest measurements and observation reports attempt to provide data on how debates influenced students' analytical thinking and problem-solving skills. A focus group discussion provides information on students' perceptions of the Parliamentary debate-based instructional model.

Students' analytical thinking and problem-solving skills influenced via debates

The pretest and posttest measurements

The data for this section was drawn from the Test of Analytical Skills (TAS), the Quiz entitled "Get Ready to Test Your Analytical Skills!" (QGRTAS), and the problem-solving inventory (PSI). The paired sample t-test was used to identify whether the mean difference between two sets of measurements in students' analytical thinking and problem-solving skills occurred.

Table 1. Results yielded from the pretest and posttest measurements

Tests	Mean		SD		t	Mean difference	SE difference	p	df
	Before	After	Before	After					
AT	5.50	7.45	1.92	1.54	–7.37	–1.95	0.265	<.001	21.0
QGRTAS	53.7	65.5	14.9	12.5	–5.72	–11.7	2.05	<.001	21.0
PSI	54.2	62.0	9.99	10.76	–6.10	–7.73	1.27	<.001	21.0

As can be seen in Table 1, the debate-driven instructional model brought positive change to students' analytical thinking and problem-solving skills. This is supported by the statistically significant Mean differences in all the measurements (–1.95 for AT, –11.7 for QGRTAS, –7.73 for PSI) with t_{AT} = –7.37, t_{QGRTAS} = –5.72 and t_{PSI} = –7.73. The observed effect size also supported the text results with values $d_{AT} = 1.67$, $d_{\text{QGRTAS}} = 1.22$ and $d_{PSI} = 1.30$, which indicated a large effect. The values drawn from the Normality Test (Shapiro-Wilk) were greater than 0.05 and showed that the data were normal. W_{AT} = 0.913 ($p = 0.055$), W_{QGRTAS} = 0.887 ($p = 0.016$), and W_{PSI} = 0.972 ($p = 0.766$).

The observation reports

These were consolidated and analysed using the Voyant Tools. The most frequent words in the corpus of the reports were as follows: challenging, analyses, knowledge, problem, and research.

Figure 2. The frequency of the use of the terms identified by the Voyant Tools in the corpus of the reports

The most frequent collocations with strong correlations were as follows: 'analyses-problem' ($r = 1$), 'analyses-research' ($r = 1$), problem-solving ($r = 1$), 'challenging-sufficiently' ($r = .989$), 'high-knowledge' ($r = .904$), 'behaviour-knowledge' ($r = .893$) 'activities-interactions' ($r = .763$), 'encouraged-know' ($r = .756$).

Below are some of the quotes from the reports:

> *[… students were assigned with challenging tasks to pursue challenging learning goals and received inspiring feedback after the class…]*
> *[… expressing arguments was a way to take risk … the students referred to the sources or cited specific examples…]*
> *[…positive culture for learning was promoted in the class…]*
> *[… students shared deep insights, provided argument-lead solutions to the problems, showed interest in searching and sharing information…]*

The above implied that the observers noticed that the lessons were organised in a way that could sufficiently challenge the students, engage them in the search of information, and presenting their findings based on the facts and statistics. The descriptive statistics based on the observation checklist are presented in Table 2.

Table 2. Descriptive statistics based on the observation checklist

	Observer 1	**Observer 2**	**Observer 3**
$N_{students}$	22	22	22
Mean	3.14	3.05	3.23
Std. error mean	0.119	0.180	0.130
Median	3.00	3.00	3.00
Standard deviation	0.560	0.844	0.612
Variance	0.314	0.712	0.374
Shapiro-Wilk W (p)	0.733 (<.001)	0.794 (<.001)	0.767 (<.001)

As can be seen in Table 2, the observer's judgements based on the checklist rated the students' and instructors' performance in debates as generally "good". Their judgements were approximately unanimous.

Students' perceptions of the Parliamentary debate-based instructional model

Focus group discussion held outline ($n_{participants} = 9$)

Question 1. Having analysed the corpus of the students' responses to the question the Voyant Tools, it was found that the most frequent words in the corpus were as follows: benefits, job, specialism, practical, and activities (See the word cloud in Figure 3).

Figure 3. The frequency of the use of the terms identified by the Voyant Tools in the corpus of the students' responses to the first question

The relative frequencies of the most frequent terms in the students' responses to Question 1 were as follows: the relative frequency for "benefits" was 0.296, the Rel. freq. for "job" was 0.288, the Rel. freq. for "specialism" was 0.281, the Rel. freq. for practical was 0.274, and the Rel. freq. for "activities" was 0.263.

Table 3 presents the results of the analysis of the correlation of the most frequent terms such as benefits, job, specialism, practical, and activities.

Table 3. Analysis of the correlation of the most frequent words

Term 1		Term 2	Correlation*	Significance**
benefits	←→	professionally	1	0
job	←→	problem-solving	0.887	0.0111
specialism	←→	develop	0.849	0.0121
practical	←→	outcomes	0.795	0.0165
activities	←→	analytical	0.772	0.0229

Note: *the closer the value is to +1, the correlation is the stronger; **the value of ≤ .05 indicates a strong correlation.

The analysis of the correlation of the most frequent terms provided in Table 3, implies that the sampled students associated their learning experience with professional benefits, the practical value of the debates, specialism development, and analytical activities. Overall, the answers suggest that the sampled students appreciated participation in the debates.

The summary of the focus group discussion is presented by themes that were drawn from the coding procedure. The themes are as follows: changes in processing information, improvements in analytical thinking due to debates, and suggestions concerning the use of the debates. Under the theme of changes in processing information, 5 students reported they improved their search skills, and information processing speed. Two students responded they developed their communication skills, persuasion, and argumentation skills. Two students stated that they felt their model of behaviour changed. The common quotes were as below:

> *[… it is much easier for me to find relevant information, and I feel I process it quicker than my peers…]*
> *[… I explain my thought much clearer and my mates and friends say that they like how I explain things to them…]*

Under the theme of improvements in analytical thinking due to debates, 9 students reported that they had a change in their abilities to specify the concept or problem, dissect its elements, consolidate information for making a decision, evaluate it, and draw conclusions from it. The quotes were as follows:

> *[… I approach information more critically and analytically…]*
> *[… my friends hire me to edit their essays and course-papers reasoning that my vision of it helps them to improve it …]*

When providing suggestions concerning the use of the debates, three students suggested and the others agreed that using the debate-driven programmes in different programmes and for different purposes would bring more benefits to their learning. The quotes were as follows:

[… I suggest using the debates in programmes of Economics…}
[… I am sure that introducing cross-institutional or cross-disciplinary debates could be cool…]
[… attracting potential employers to participate in the debates could be a good experience and practice …]

As can be viewed, the students' responses were generally positive about debate-based intervention.

Discussions

The study attempted to identify what effect the debates had on the analytical thinking abilities in tertiary students and how the debates as an instructional approach were perceived by the students. The novelty of the attempt is in reshaping the curriculum in International Economics course to shift from the conventional lecture-based delivery to the debate-driven instructional model, creating the online community and the use of additional tools to engage and manage the students, to poll them and decide on the topic for the debate, to design and deliver different quests, to impose additional cognitive load through training logic, analytical thinking and to run the training activities and debates. It was found that the instructional model used in the study enhances the components of students' analytical thinking involving the abilities of analytical thinking and problem-solving skills.

The results drawn from the pretest and posttest measurements, observation reports, and a focus group discussion showed that the debate-driven instructional model brought positive change to students' analytical thinking and problem-solving skills. This was supported by the statistically significant Mean differences in all the measurements (–1.95 for AT, –11.7 for QGRTAS, –7.73 for PSI) with t_{AT} = –7.37, t_{QGRTAS} = –5.72 and t_{PSI} = –7.73. The observed effect size also supported the text results with values $d_{AT} = 1.67$, $d_{\text{QGRTAS}} = 1.22$ and $d_{PSI} = 1.30$, which indicated a large effect. The values drawn from the Normality Test (Shapiro-Wilk) were greater than 0.05 and showed that the data were normal. W_{AT} = 0.913 ($p = 0.055$), W_{QGRTAS} = 0.887 ($p = 0.016$), and W_{PSI}= 0.972 ($p = 0.766$).

The above findings align with the previous relevant research. These agree with Robb (2015) stating that the teaching strategies that form the basis for training in debating – modelling and guided practice, practice in collaborative independent learning, and scaffolded practice – transform the students from passive readers into a confident and ambitious personality who can comprehend, analyse information and make 'just right' decisions on what to read. Results agree with Abernathy & Forestal (2019), Gooblar, (2016), Najafi et al., (2016), and Williams-Brown (2015), who revealed that debates enhance students' motivation, boost their academic achievements, engage students in learning better, and increase students' brain capacity. The results contribute to the teaching and learning models aimed at developing analytical thinking in tertiary students that were outlined by Sartika (2017). These models, that are integrated in the debates training, were as follows: analytical thinking skills training process, problem-based and guided inquiry learning, group investigation and context-based learning, the MURDER strategy (Mood, Understand, Recall, Digest, Expand, Review) and the use of infographics (Information and Graphics).

The above data were supported by the results of the observation reports that were analysed using the Voyant Tools. The most frequent words in the corpus of the reports were as follows: challenging, analyses, knowledge, problem, and research. The most frequent collocations with strong correlations were as follows: 'analyses-problem' ($r = 1$), 'analyses-research' ($r = 1$), problem-solving ($r = 1$), 'challenging-sufficiently' ($r = .989$), 'high-knowledge' ($r = .904$), 'behaviour-knowledge' ($r = .893$) 'activities-interactions' ($r = .763$), 'encouraged-know' ($r = .756$). The observer's judgements based on the checklist rated the students' and instructors' performance in debates as generally "good". Their judgements were approximately unanimous. These findings implied that the observers noticed that the lessons were organised in a way that could sufficiently challenge the students, engage them in the search of information, and presenting their findings based on the facts and statistics. The results obtained from the students' responses to the first question in the outline focus group discussion and analysed using the Voyant Tools found that the most frequent words in the corpus were as follows: benefits, job, specialism, practical, and activities. The relative frequencies of the most frequent terms in the students' responses to Question 1 were as follows: the relative frequency for "benefits" was 0.296, the Rel. freq. for "job" was 0.288, the Rel. freq. for "specialism" was 0.281, the Rel. freq. for practical was 0.274, and the Rel. freq. for "activities" was 0.263. The above suggested that the sampled students associated their learning experience with professional benefits, the practical value of the debates, specialism development, and analytical activities. Overall, the answers suggest that the sampled students appreciated participation in the debates. The students also reported improvements in their search skills, information processing speed, communication skills, and behaviour model. They mentioned that they enhanced their leadership abilities, persuasion, and argumentation skills together with computer skills. The students felt a change in their abilities to specify the concept or problem, dissect its elements, consolidate information for making a decision, evaluate it, and draw conclusions from it. These findings go with Trujillo-Jenks and Rosen (2015) who revealed that through arguing they learned better the real-world relevance of the course material. Interestingly, the researchers also found that arguing the opposite position brings more benefits to the students than arguing a position consistent with their views, $t(21) = 2.48$, $p < .05$.

Conclusion

The study found that the debates improve the students' analytical thinking abilities and are perceived positively by them. The pretest and posttest measurements results, observation reports, and a focus group discussion showed that the debate-driven instructional model brought positive change to students' analytical thinking and problem-solving skills. This was supported by the statistically significant Mean differences in all the variables and the results of the observation reports showing that the most frequent words in the corpus of the reports were as follows: challenging, analyses, knowledge, problem, and research. These observers' reports implied that the lessons were organised in a way that could sufficiently challenge the students, engage them in the search of information, and presenting their findings based on the facts and statistics. The students reported that they appreciated participation in the debates as they associated the experience with job benefits, the practical value of the debates, learning engagement, and research. The students also responded that they improved their search skills, information processing speed, communication skills, and behaviour model. They mentioned that they enhanced their leadership abilities, persuasion, and argumentation skills. The students felt a change in their abilities to specify the concept or problem, dissect its elements, consolidate information for making a decision, evaluate it, and draw conclusions from it.

Recommendations

The use of debates requires that the practitioners were well-trained in moderating debates, and the students should be aware of a debate procedure. The students should be divided into groups and each group should be managed by an experienced tutor. The researchers should study how training in NLP techniques effects the overall instructional efficiency of the debates as an instructional approach.

Limitations

The study limitations are as follows: the number of the sampled students, the participation of only one institution in the experiment, and observational data leave the likelihood of residual confounding.

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Conflicts of Interest

The authors disclose that they have no conflicts interest related to scientific aspects or financial relationships or affiliations that have a stake in the subject of the manuscript and can be associated with the study.

References

3SmartCubes. (2020). *Test of analytical skills*. https://www.3smartcubes.com/pages/tests/analytical-skills-test/analytical-skills-test_instructions/

American Parliamentary Debate Association. (2020). *Guide to APDA & FAQs*. https://apda.online/about/guide-to-apda/

Abernathy, C., & Forestal, J. (2019). The use of debates in political science courses. *Journal of Political Science Education, 1*(13), 1-7. https://doi.org/10.1080/15512169.2019.1656082

Ang, R. X., Chew, Q. H., Sum, M. Y., Sengupta, S., & Sim, K. (2019). A systematic review of the use of debates in health professions education - does it work? *GMS Journal for Medical Education, 36*(4), 1-15. https://doi.org/10.3205/zma001245

Astafieva, M. M., Bodnenko, D. M., & Proshkin, V. V. (2019). Using computer-oriented Geometry means in the process of critical thinking formation of future Mathematics teachers. *Information Technologies and Learning Tools, 71*(3), 102-121. https://doi.org/10.33407/itlt.v71i3.2449

Bacikova, Z. (2018). The role of a debate in the development of critical thinking. In D. Petranová & S. Magál (Eds.), *Proceedings to the International Scientific Conferenc*e (pp. 18-37). University of Ss. Cyril and Methodius.

Bobrytska, V., Luzik, E., Reva, T., Spitsin, Y., & Akmaldinova, V. (2020). Involving stakeholders in shaping educational legislation and policy in Ukraine. *European Journal of Educational Research, 9*(3), 1189-1200. https://doi.org/10.12973/eu-jer.9.3.1189

Brownson, C. (2013). Classroom participation and knowledge gain. *Journal of Education and Practice, 4*(18), 78-83.

Wilson, M., & Brown, Z. (2016). The complexity of in-class debates in Higher Education: student perspectives on differing designs. *Educational futures: E-journal of the British Education Studies Association, 7*(2), 14-28.

ProProfs Quizzes. (2020). *Get ready to test your analytical skills!* https://www.proprofs.com/quiz-school/story.php?title=analytical-skills

Chicago State University. (2020). *Analytical thinking: Definition.* https://cutt.ly/hcrvc3j

Critical Thinking Secrets. (2020). *Critical thinking vs Analytical thinking*. https://criticalthinkingsecrets.com/critical-thinking-vs-analytical-thinking/

Doody, O., & Condon, M. (2012). Increasing student involvement and learning through using debate as an assessment. *Nurse education in practice, 12*(4), 232-237. https://doi.org/10.1016/j.nepr.2012.03.002

Gooblar, D. (2016). *Skills first, and let content follow.* The Chronicle Vitae. https://chroniclevitae.com/news/1551-skills-first-and-let-content-follow

Hanacek, J. (2010). *Phases of the research process.* Comenius University.

Irwanto, I. (2018). Integrated measurement of students' analytical thinking skills and science process skills. In D. E. Irawan, S. Viridi, E. Mulyana & L. M. Nurani (Eds.), *Proceedings of International Seminar on Science Education: Harmonisation of Science, Technology, and Society in Science Learning to Prepare 21st century Generation* (pp. 217-225). INA-Rxiv Papers. https://doi.org/10.31227/osf.io/6qyhd

Montanes, N., Lascano, D., Quiles-Carrillo, L., Torres-Giner, S., & Rayón, E. (2020). Ethical dilemmas and debates as teaching methodologies to develop critical thinking competence. In L. G. Chova, A. L. Martínez, & I. C. Torres (Eds.), *Proceedings for 14th International Technology, Education and Development Conference* (pp. 5339-5343). IATED Academy. https://doi.org/10.21125/inted.2020.1441

Najafi, M., Motaghi, Z., Nasrabadi, H. B., & Heshi, K. N. (2016). "Debate" learning method and its implications for the formal education system. *Educational Research and Reviews, 11*(6), 211-218. https://doi.org/10.5897/err2015.2316

Nurakhir, A., Nindya Palupi, F., Langeveld, C., & Nurmalia, D. (2020). Students' views of classroom debates as a strategy to enhance critical thinking and oral communication skills. *Nurse Media Journal of Nursing, 10*(2), 130-145. https://doi.org/10.14710/nmjn.v10i2.29864

Nureldeen, W. (2020). Using classroom debates to develop EFL students' pragmatic competence and critical thinking. *International Journal of Language Academy, 8*(4), 90-109. https://doi.org/10.29228/ijla.44227

Price, P., Jhangiani, R., & Chiang, I. (2015). *Research methods in psychology – 2nd Canadian edition*. BCcampus. https://opentextbc.ca/researchmethods/

Robb, L. (2015). *Strategies to improve students' analytical thinking.* EDUblog. https://edublog.scholastic.com/post/strategies-improve-students-analytical-thinking

Sadler, T. D. (2010). Debates in the classroom. In C. S. Clauss-Ehlers (Ed.), *Encyclopedia of Cross-Cultural School Psychology*. Springer. https://doi.org/10.1007/978-0-387-71799-9_125

Sartika, S. B. (2017). Teaching models to increase students' analytical thinking skills. In T. W. Abadi, N. E. T. I. Santosa, M. T. Multazam, F. Megawati (Eds.), *Proceedings of the 1st International Conference on Intellectuals' Global Responsibility* (pp. 216-218). Atlantis Press. https://doi.org/10.2991/icigr-17.2018.52

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *Cologne Journal of Sociology and Social Psychology/ Kolner Zeitschrift fur Soziologieund Sozialpsychologie, 69*(2), 107-131. https://doi.org/10.1007/s11577-017-0454-1

Soliman, A. M. (2014). The problem-solving inventory: Appraisal of problem-solving in the Arab context, factor structure, and validation. *International Perspectives in Psychology: Research, Practice, Consultation, 3*(4), 252-267. https://doi.org/10.1037/ipp0000020

Toner, P., & Woolley, R. (2016). Perspectives and debates on vocational education and training, skills, and the prospects for innovation. *Spanish Journal of Sociology/ Revista Española de Sociología, 25*(3), 319-342.

Trujillo-Jenks, L., & Rosen, L. (2015). *Fostering student learning through the use of debates.* Faculty Focus. https://cutt.ly/wcv8erw

Walker, J. P., & Sampson, V. (2013). Learning to argue and arguing to learn: Argument-driven inquiry as a way to help undergraduate chemistry students learn how to construct arguments and engage in argumentation during a laboratory course. *Journal of Research in Science Teaching, 50*(5), 561-596. https://doi.org/10.1002/tea.21082

Williams-Brown, Z. (2015). The use of in-class debates as a teaching strategy in increasing students' critical thinking and collaborative learning skills in higher education. *Educational futures: E-journal of the British Education Studies Association, 7*(1), 39-55.

Xi, X., & Sawaki, Y. (2016). Methods of Test Validation. In E. Shohamy, I. Or, & S. May (Eds.), *Language Testing and Assessment. Encyclopedia of Language and Education* (3rd ed.) (pp. 193-209). Springer. https://doi.org/10.1007/978-3-319-02326-7_14-1

Yulina, I. K., Permanasari, A., Hernani, H., & Setiawan, W. (2019). Analytical thinking skill profile and perception of pre-service chemistry teachers in analytical chemistry learning. *Journal of Physics: Conference Series, 1157*(4), 1-7. https://doi.org/10.1088/1742-6596/1157/4/042046

Appendix

The Checklist for Observation Reports

#	Item	4-point Likert scale			
		1	**2**	**3**	**4**
1	How would your overall impression of the debate?				
2	How would you rate the instructor's performance?				
3	How would you rate the effectiveness of the debaters?				
4	How would you rate the analytics performed by the students to make their arguments?				
5	How would rate the cohesion and coherence of the presented arguments?				
6	How would you rate the speed of the students' reaction to the opponents' arguments?				
7	How would you rate the relevance, feasibility, and appropriateness of the suggested solutions?				

Note: 1 means 'poor', 2 = 'average', 3 = 'good', 4 = 'excellent'.