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Design of a Program Based on the Facione and Gittens Model in Modifying Radical Thinking

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Abstract

Introduction. The research aimed to construct an instrument (test) for measuring the degree of radical thinking among students of the University of Mosul and design a program based on the Facione and Gittens model to know its effect in modifying radical thinking. The construction sample consisted of 400 male and female students, from which an experimental and control sample was drawn after diagnosis, amounting to 68 male and female students. **Methods**. The researchers designed a program based on the Facione and Gittens model with 26 sessions, and the psychometric properties of the test were extracted (validity in its types and reliability), and the percentage of agreement of the experts on the dimensions and positions of the radical thinking test reached (0.94), and the reliability coefficient of the radical thinking test by retesting reached (0.86). **Results**. The results showed after statistical processing using the (t) test for one sample that the arithmetic mean of the sample individuals in the pre-test amounted to (103) degrees and a standard deviation of (3.17), and when compared to the hypothetical mean of the test, which is (80), it was found that the arithmetic mean is higher than the hypothetical mean of the radical thinking test, as the calculated (t) amounted to (59.79), which is higher than the tabular t-value (1.98). The results showed the effectiveness of the program in modifying radical thinking in the post-test for the two experimental groups (males and females), with a clear decrease in the arithmetic mean of the pre-test (103), and the arithmetic mean in the post-test amounted to (79.56), while at the same time, no modification appeared in the control group. **Discussion**. The researchers reached some conclusions

through the results, including the existence of a difference between the results of the pre-and post-test in favor of the post-test, which is attributed to the role of the program. The program contributed significantly to modifying the utopian radical thinking of the students of the University of Mosul, and this contribution was reflected in the development of critical thinking skills and positive mental habits among them.

Keywords

Facione & Gittens model; Radical thinking; Utopian thinking; Dystopian thinking; Interpretation; Analysis; Inference; Evaluation; Explanation; Self-regulation

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Introduction

The old view that the curriculum is some sacred canon of documented wisdom no longer holds. Students need a “thinking curriculum” that asks them to challenge their worldview. This framework will help them decode the world and examine the vast amounts of information available. Teaching thinking is a big topic, but it is not new. Yet the teaching of thinking skills is still largely ignored in school curricula. One of the main explanations for neglecting to teach these thinking skills in educational institutions is that the curriculum is still dominated by content (there is no arguing that content knowledge is important), but facts, figures, and a good memory alone are not enough for teaching and learning. A new skills-based curriculum, which requires a systematic approach to teaching thinking skills, is what is needed if teachers are to develop a culture of curiosity, confidence, and independence in their students. The curriculum is more than just a document, whether it is a statement of grand aims or a set of detailed prescriptions. What happens in schools and universities is that students’ purposes are reconciled with teachers’ wider aspirations, where students’ needs are assessed and provided for so that learning can take place (Gabrielle C, 2003).

So much of what is taught in a university environment is theoretical and not factual, although it is based on real evidence, the majority of thinking is inferences drawn by writers and

researchers from their analyses of relevant data. They propose ideas about what is happening in the world and then look for evidence to support or challenge these ideas; they may succeed in finding evidence to support their ideas, or they may fail, and here problems may arise due to not reaching what supports their ideas reliably, causing them stress as a result of these failures (Judge et al., 2009) so, university students face various problems in their daily lives that they must solve because they represent a stressor for them. Moreover, they undergo vital changes in their lives on the intellectual, psychological, physiological and behavioral levels, which leads to stress that makes them vulnerable to unexpected severe reactions (Abdellatif, 2022).

Unfortunately, the daily pattern of thinking in Arab societies consists of superstition and fanaticism that eliminates free thinking and the ability to question and criticize, and submission to authority or intellectual references leads to the idea of cancelling the ability of the mind to launch and liberation and puts obstacles to thinking that is based on argument and proof, and all of this results in a lack of knowledge, corruption in the method of thinking, inability to search, and failure to deal with the laws, principles, and laws of the universe (Zagha, 2010).

Therefore, learning thinking skills is essential for every learner, as it is not only a skill limited to gifted, outstanding, or ordinary students. but a necessary language that everyone needs to learn and develop. The individual may face some situations that need to plan or make the right decisions, which requires him to implement thinking skills, and teaching these skills requires the teacher to use a variety of educational situations and unfamiliar information to produce new outputs that suit the educational situation (Al Balushi, 2014).

Theoretical background

Facione & Gittens model

Facione & Gittens (2016) define their model as: "A set of central skills for critical thinking, namely: (interpretation, analysis, evaluation, reasoning, clarification, and self-organization), employed by the individual with a set of seven positive mental habits, namely: (searching for the truth; open-minded; analytical; systematic; confident of logic and reasoning; curious; and wise), to confront negative thoughts and habits, represented by (denial of the truth or intellectually deceitful; closed-minded or intolerant; is not analytical or oblivious to the consequences; random or disorganized; hostile to logic and reasoning; inquisitive or indifferent; unwise), to solve the problems facing him" (Facione & Gittens, 2016).

The importance of critical thinking in the process of education and educational assessment led to the creation of a team of American and Canadian scholars from various disciplines in the late 1980s. Their main task was to study critical thinking. The study was conducted by educational researchers and philosophers (Hitchcock, 2017), including Peter Facione, a professor at the University of Chicago. The skill of rational decision-making and self-regulation. The Delphi report describes in detail the main skills and sub-skills of critical thinking and gives

relevant examples. Facione (1992-2020) identified the basic skills developed by Facione and Gittens (Mike and Tasola, 2021).

According to Facione & Gittens (2013), critical thinking involves truth-seeking, open-mindedness, analysis, methodology, self-confidence, curiosity, and maturity (Arsal, 2015), and critical thinking is both a skill and an action, including applying, analyzing, constructing, and evaluating information, and it includes the stage of cognitive development (Facione et al., 2021).

Facione found that critical thinking skills among students can be enhanced through classroom instruction (Triyanto & Wahidin, 2022). Critical teaching refers to any form of teaching that develops, under the active participation of students, data collection and processing activities with the aim of filling higher-order cognitive functions, leading to the formation of concepts, judgments, generalizations, interpretations, and explanations of situations and the world around them (Mike and Tasola, 2021). These skills, as defined by Facione and Gittens (2016), include:

- Interpretation: Facione and Gittens saw interpretation as the ability to understand and explain the meaning of data or information. Ability is the criterion that determines whether or not someone is able to understand data, information, or problems (Marni, 2020), Students with good interpretation skills will simply understand and make sense of different experiences and events. There are three sub-skills of interpretation that cover categorization. Categorization is used to sort and classify information into subcategories, report what is being tested, and classify results or opinion statements. Coding is used to reveal the content of information and provide meaning during communication and explanation. Clarification is used to create explanations by identifying, describing, and similar meanings of certain words, ideas, or concepts… (Sajidan & Y Rinanto, 2018).
- Analysis: Facione & Gittens defined analysis as the ability to identify the inferential relationship between different expressions of ideas, judgments, experiences, or information (Ningtiyasa & Harun, 2021). Critical thinking is the ability to analyze information clearly and connect ideas logically. When combined with problem-solving skills, students are able to think logically about important situations and events, helping them determine the best possible solutions (Kumar, 2019).
- Inference: Facione & Gittens defined inference as the ability to identify and synthesize elements necessary to draw logical conclusions, form hypotheses and conjectures, and consider relevant information to draw conclusions from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation. Subskills of reasoning include: querying evidence, guessing alternatives, and drawing conclusions (Facione, 2015). In the reasoning component, students are trained to form hypotheses by allowing them to make decisions based on logical and relevant data. Students who can draw conclusions are highly skilled because they respond thoughtfully and relate to the correct information (Saekawati & Harun, 2021).
- Evaluation: Critical thinking is an evaluative ability that shows a person's ability to see the gap between reality and reality by referring to ideals, and the ability for evaluating and analyzing data, information, and cognitive representations (Nurhayati et al, 2022),

and evaluation is a person's ability to explain or describe their perceptions, experiences, attitudes, judgments, beliefs, or opinions and for assessing the logical power of actual or intended interferences involving statements, descriptions, questions, or other forms of cognitive representations (E. Yuliani et al, 2022).

- Explanation: Facione, the meaning of clarification as the ability to "demonstrate and justify that logic in terms of the probatory, conceptual, methodological, normative and contextual considerations on which an individual's findings were based; and to present logic in the form of compelling arguments." "Statement of results", "justification procedures" and "presentation of arguments" are the three sub-skills of the skill of clarification (Al-Rahbi et al, 2022).
- Self-regulation: Self-regulation involves the process of thinking (self-examination) and making necessary corrections (self-correction). During educational research, critical thinkers might ask, “Are my biases influencing my responses to these results?” or “Do I understand the implications of this research design?” (Suter, 2011). Facione explains that critical thinking is closely linked to self-regulatory learning skills, as it relies on students’ ability to direct their own learning after careful evaluation of the material being taught (Al-Shaye, 2021). When students learn to ask thought-provoking questions in and out of the classroom and provide descriptive answers, they are moving toward self-regulating their learning (Wale & Kassie, 2020).

The way a teacher presents a curriculum or subject significantly affects the independence of learning and students' thinking habits about that curriculum or subject that is expected to increase students' motivation and competence. In addition to taking into ac-count their social conditions, the strategies used must also be compatible with the nature of the learning materials (Rikizaputra et al., 2021).

Educational programs are centered around developing youth confidence, perseverance, organization, compatibility, and resilience in order to eliminate the five negative mental habits that constitute barriers to learning and well-being: feeling anxious, feeling frustrated, procrastination, lack of attention, and feeling angry (Theodore, 2017).

Curriculum designers emphasized content coverage and exploration of knowledge related to testing (exam). When school staff begin to adopt habits of mind, thinking be-comes the focus of curriculum, teaching and assessment. For many teachers, this is a shift in thinking. For example, if the intention of teaching is to learn a certain behavior that assumes that there is a set of knowledge that students need to learn and test, it will only be necessary to follow certain habits of thought. (Costa & Bena, 2016), Costa (2001) asserted that ignoring habits of mind leads to poor learning results and poor task performance. Costa therefore alerts us to the importance of direct teaching habits of mind in a rich and supportive environment (Al-Asqah et al, 2021), The seven positive habits of mind as identified by Facione and Gittens include:

- Truth-seeking: which is an individual has intellectual integrity and a courageous desire to actively seek the best possible knowledge in any specified situation. The truth seeker asks investigative questions and follows the reasons and evidence anywhere they are, even if the outcomes contradict their cherished beliefs.

- Open-minded: which is an individual is tolerant of divergent points of view, respects others in having different opinions.
- Analytic analytical: which is an individual is usually alert to possible problems and attentive in anticipating consequences and attempting to predict short and long-term results of events, decisions and actions. Another word for describing this habit of mind may be "insight."
- Systematic: A person who always seeks to follow a systematic and comprehensive approach to identifying and solving problems. He is characterized by focus, perseverance, and diligence in his approach to problem solving, learning, and investigation.
- Confident in thinking: A person who trusts his ability to think to make good judgments. This confidence may or may not be justified, depending on the context.
- Inquisitive: A person who always seeks to gain knowledge and understand how things work, and loves to learn new things in a wide range of subjects, even if the immediate benefit is not obvious. He is characterized by a strong sense of intellectual curiosity.
- Judicious: A person who approaches situations or problems with the understanding that some may be disorganized or have more than one reasonable solution. He has the cognitive maturity that allows him to realize that many questions and issues are not clear, and that sometimes decisions must be made in contexts of uncertainty (Facione et al, 2016).

But failure to achieve these positive mental habits will be met with negative mental habits that create many problems for the individual, among those problems is what is called radical thinking.

Radical thinking

Gordin et al. (2010) define radical thinking as: "An epistemological process that includes distorted, contradictory, and extreme (utopian-Dystopia) visions and perceptions of human nature. Utopian visions amplify the positive aspects of human nature, and imagine an ideal flawless future, while dystopian perceptions amplify the negative aspects of human nature, and imagine a bitter, miserable and insecure future. This duality of human nature makes it impossible to achieve pure (utopian-Dystopia) perceptions but rather requires a combination of the two. This dual vision allows us to visualize the con-sequences of certain societal ideologies, policies, and structures, and by exploring those extreme visions and scenarios, we can better understand the potential consequences of our actions and make informed decisions about the future by considering alternative possibilities" (Gordin & etal, 2010).

Radicalism is a continuous, circumstantial state of mind that borders “moderate radical thinking" and "radical utopian or Dystopia thinking." Radical ideas can have a remarkably wide appeal to their believers (Sukabdi, 2018), the scientist Desmond Tutu saw radicalization as not allowing different points of view, that is, building one’s point of view, as something very exclusive and not accepting the existence of potential differences, in the sense of rejecting another perspective. Radicalism is a mental and emotional process that can motivate persons

to pursue incompatible behavior. Radicalism is triggered by a process of change in the psycho-cognitive construction of persons into new identities that are part of behavior change. Since radicalism is understood as a process, it can be said that a person's radical views and attitudes always manifest themselves in the form of an intellectual ideology and the values of the belief system obtained through the process of socialization (Asrori et al, 2019).

The faltering development process exposes young people to the harsh effects of exclusion, for example identity formation crises among young people as well as other social crises such as: poverty, unemployment, inequality, unfair treatment, and oppression, in addition to the process of marginalizing and excluding them from most important aspects of life. This failure leads young people in Arab countries to form exaggerated (mostly compensatory) perceptions of society and the future and provides fertile ground for radical thinking and action among young people (Al-Badayneh et al,2023), in the social and psychological literature, experiences of exclusion and a polarized worldview are cited as the main causes of youth radicalization. Both radical thinking and action in many respects meet the specific needs of young people such as protest behavior, adventure, and collective belonging to a particular group or group, and therefore carry great appeal (Danish Youth Team, 2019).

Radicalism is an attitude or thinking that consists of four main features (Mujani et al, 2020): no tolerance or appreciation for the opinions of others; a fanatical attitude that justifies itself by blaming others; a closed attitude and efforts to appear different; and finally, a revolutionary attitude that tends to exaggerate either positively or negatively. Note that the term "radical" has no meaning in itself because the content of radical thought depends on the context. So-called radicalism is based on what is considered prevalent in a given society (someone may be considered radical in one society, and may not be viewed in the same way in another). The social and political system plays a role in this context. In non-democratic societies, people striving for freedom of expression and other democratic rights are labeled as extremists while the opposite applies to democratic societies (De Meere & Lisa, 2015).

In recent years, the growth of radical thinking in higher education has increased based on the results of surveys conducted by some countries. These studies attempt to make recommendations so that radical thinking in higher education is not contagious. (Waseso & Anggitiyas, 2021), the emergence of radical ideas is so dangerous to life that they need supervision by universities. Radical thinking makes society chaotic and indifferent, so it requests to return to understand the process of consensus (Aulia & Nurussakinah, 2023).

The results of some of the researches presented to universities included the follow-up and development of curricula and activities on campus, the appointment of lecturers and staff, the targeting and tracking of graduates, and the organized preventive measures taken by universities to prevent the inflation of radical extremist thinking among All these procedures are done by empowering students with critical thinking skills and positive habits of mind, to develop so-called moderate radical thinking (Rokhmanm et al, 2021).

Moderate radical thinking needs a critical and deep mindset and a willingness to look beneath the surface of various phenomena. Via promoting moderate radical thinking and

critical thinking, it allows us to imagine the deep future, moderate radical thinking evokes new ideas and unexpected reactions from beneath the surface of everyday perception by offering amazing, directed, and new ideas (Heinonen & Juho, 2013), moderate radical thinking may be seen as indispensable for producing innovative insights that will help overcome many of the failures and crises surrounding us (Melis et al, 2017).

Contemporary educational policies and debates focus on how to relate aspects of radical (utopian and Dystopia) moderate ideas (Ruggiero, 2014), so educational programs must be smooth and adaptable, requiring teachers to treat their curriculum as design problems, to be solved with creative, critical, and radical moderate thinking (Rebecca, 2019), the vision for the future of radical thinking includes an invitation mostly addressed to the younger generation who have critical thinking to begin a dialogue with theories of change developed within program plans in various disciplines (Monticelli, 2018).

Radical extreme thinking consists of utopia/dystopia thinking: utopia relies on ways of interpreting the present with an eye to the future (imaginary but positive). Dystopia thinking relies on interpreting the present with an eye to the future (imaginary but negative) (Gill, 2017).

Utopian thinking

Can we understand the world through our imagination alone? We might be tempted to answer no, since our imagination can, at best, only give us knowledge about our mental states. However, the use of thought experiments in areas such as virus transmission, personal identity, moral responsibility, and consumer behavior seems to suggest otherwise. In discussions of "How can we know reality through thought alone?", we find two extreme positions: the Platonic position of James Robert Brown, who holds that some thought experiments provide intuitions about the world, and the Empiricist position, which regards thought experiments as merely imaginary forms of argument or as rationally reconstruct able. But there is a middle position between these two extremes, which is that thought experiments are mental models. At the same time, attention has turned to what can be reliably asserted in counterfactual scenarios, and how knowledge or understanding of the world can be gained in the face of a dearth of new empirical information. Utopia is called upon to understand how modernity has emerged in thought experiments (Linsbichler & Ivan, 2023).

Humans have a real impact on changing lives and redirecting their thoughts, particularly their beliefs influences, emotions, and actions. The perfect result of such a powerful utopian vision that shapes life is the response that says, in fact, "I truly believe in a perfect new world that could be like this! A "definitive normative prediction" that turns into in-spiration and commitment, based on which utopian thinking is formed (Hanna & Otto, 2022), in psychology, Utopia is considered "a symbolic representation of an ideal human world" (Logan et al, 2020).

Utopia was conceived as general utopian thinking, that refers to people's tendency for imagining an ideal society and what it might look like. By measuring general utopian thinking, it was found that it was associated with the activation of (compensation, criticism, and change)

utopian functions. Furthermore, engaging in this thinking has been shown to enhance critical intentions and change society (Basso & Dario, 2022).

The functions of utopia are diverse and involve compensation in the form of day-dreams and fantasies, criticisms of existing conditions and the ability to arouse a desire to transform into a better lifestyle. For Levitas, the fundamental aspect of utopianism is the space for thinking and feeling outside existing normative and conceptual frameworks, or to desire differently (Johnson, 2006).

Bloch described utopian ideas as "daydreams" that evoke what has been suppressed in reality, and paint a hopeful picture of an ideal world that has not yet been done (in the future). (Cruz, 2022), and this is an absolute interpretation of utopia, as a counter-image to the present that it expresses ideas of desire for impossible perfection and that this pursuit of perfection will inevitably lead to violence and oppression in the real experimental world towards the future. (Lakkala, 2020), this aspiration to the future is part of a utopian strategy, in which "ideas" are represented in opposition to and negation of the present. However, the past is also a negation of the present and can therefore be linked to the de-sired (ideal) future (Wagner's, 2000).

Utopian ideas serve as a means of securing psychological tranquility, and as a mechanism for forcing individuals who are radically divided by their pleasures into the search for imaginary moral idealism (Rieley, 2020), utopianism is therefore a contradictory internal intellectual construct that has no rational foundations (Płachciak et al, 2015), these utopian ideas seem desirable but unattainable (Bal & Andy, 2022).

Because utopian ideas determine the upper limits of the possible worlds that people imagine, they can act as criteria against which current reality is evaluated and criticized. In this situation, the greater the contradiction between the utopian vision and the current reality, the darker and more negative one's assessment of the current reality will be, gradually turning into negative pessimistic thoughts, known as Dystopia thinking (Fernando et al, 2018).

Dystopia thinking

The term "dystopia" is derived from the Greek and means "evil." Miserable thoughts usually depict the worst social conditions filled with poverty, misery, suffering, death and disease, which is undesirable by any human being (Nazemian, 2019).

Dystopian thoughts refer to the blacker representation of an existing or potential future society, where most of the desired qualities of life are absent. Dystopian thoughts come into being as a result of social, climatic, financial, political events...It depicts the major crises haunting the contemporary world in bleak scenarios. These ideas strive to warn or provide a miserable pessimistic view of the dogmatic positions that lie at the heart of utopian ideas (Poorghorban & Bakhtiar, 2023).

The political, social, and economic crises that the world is going through have made the type of Dystopia ideas particularly common, in addition to reflecting societal fears, they (miserable thoughts), have allowed to test some common utopian concepts in an imaginary

environment (Leine, 2023), the dystopian vision is presented in many different forms and types and conveys a large number of concepts of human loss of meaning and values, unity, and degradation, but there is often a shared sense that human despair is caused by an external event such as a disaster, pollution, war, or unhappy social, eco-nomic, and political situations (Rio, 2022).

Dystopian ideas possess some peculiar features, which include: a negative, pessimistic and desperate view of miserable societies, actual or imaginary and unrealistic situations and radical imaginary regimes that are culturally, religiously, economically, socially and politically extreme (Atasoy, 2019), it is worth noting that utopian thinking and Dystopia thinking share the same imaginative function for both types of thinking: the former posing ideal imaginative ideas, and the latter knocking on miserable fantasy thoughts (Farca, 2017).

There is a relationship between both "Dystopia thinking" and "utopian thinking", so it is important to understand both words in the same order. Miserable thoughts arise when an individual feels inferior and helpless, and tries to compensate for this by reaching idealism and perfection in the personal, social, political and economic aspects, but fails to do so. Thus, in the dark mirror of utopia, Dystopia thoughts are born. Dystopian ideas, then, are the product of failed social experiments, repressive political systems, and arrogant economic systems that begin with utopian dreams put into practice (Gupta, 2021).

In the academic field of the future in education, there has been concern that students' negative and pessimistic future scenarios can be harmful to their minds and thoughts. Eckersley argued that negative thoughts and pessimism among young people can result in ridicule of the status quo, mistrust, anger, apathy, and an approach to life according to instant gratification (Nordensvard, 2014).

Research design

Research participants and procedure

The method used in this study is the experimental research method. The study community consisted of second-year university students (400 male and female students) who were selected by the stratified random sampling method from various humanities and scientific disciplines at the University of Mosul. An experimental and control sample was drawn after diagnosis, numbering (68) male and female students. After obtaining official permission from the university, the data were collected.

Measures

To operationalize the latent variables in the search, we used the following instruments:

Radical thinking test

The researchers designed an instrument (test) to measure the degree of radical thinking that contains (40) items, the highest score for the test is (120) and the lowest score is (40) with a default average of (80), the range includes moderate radical thinking (critical) is (60-100), so the minimum separation between radical thinking (miserable) and moderate radical thinking (critical) is (60), and the maximum separation between radical utopian thinking and moderate radical thinking (critical) is (100), and under each item, there are three options to choose from, and (A) was given one score because it represents radical dystopian thinking; (B) was given two scores because it represents moderate radical thinking, and (C) was given three scores because it represents radical utopian thinking. Table 1 shows one of the items of this test.

Table 1

One of the items of the radical thinking test

N	Items
1-	The state's investment in nuclear energy in various service sectors: A. It does not support its use because it is extremely dangerous, especially if it leaks or falls into the hands of extremist groups. B. It considers all possible outcomes and evaluates its effectiveness and the extent of its benefit. C. It believes that nuclear energy will radically solve the country's energy needs and preserve the environment without taking into account its danger.

Facione & Gettines program

The researchers designed a program based on the model (Facione & Gettines), consisting of 26 sessions, and each session contained skills from that model to develop critical thinking and positive habits of mind as an independent variable to which members of the experimental group are subjected. Its purpose is to modify the radical thinking of that group. Table 2 shows this.

Table 2

Content of the program

Skills	Session Number	Mental habits	Procedures for each session
--------	First meeting, introductory session	----------	----------
First Skill Training in Interpreting Skill	2	Seeking Truth and Open-mindedness Story Title: Extremism	View the story. Analyze the story. Training includes activities followed in class. Provide feedback. Home exercise.
	3	Analysis, methodology and confidence in logic Story Title: Drug Addiction	
	4	Curiosity and wisdom Story Title: Corruption	
	5	Review of interpreting skill training with positive habits of mind	
Skill Two Training in Analysis Skill	6	Seeking Truth and Open-mindedness Story Title: Crime	
	7	Analysis, methodology and confidence in logic Story Title: Domestic Violence	
	8	Curiosity and wisdom Story Title: Political Repression	
	9	Review of analysis skill training with positive habits of mind	

Skills	Session Number	Mental habits	Procedures for each session
Third Skill Training in Inference skill	10	Seeking Truth and Open-mindedness Story Title: Child Labor	
	11	Analysis, methodology and confidence in logic Story Title: Cyberbullying	
	12	Curiosity and wisdom Story Title: Unemployment	
	13	Review of assessment skill training with habits of mind	
Fourth Skill Training in Evaluation Skill	14	Seeking Truth and Open-mindedness Story Title: Environmental Degradation	
	15	Analysis, methodology and confidence in logic Story Title: Conflicts and Wars	
	16	Curiosity and wisdom Story Title: Cyber Blackmail	
	17	Review of training on reasoning skill with habits of mind	

Skills	Session Number	Mental habits	Procedures for each session
Skill Six Training in Self-regulation skill	18	Seeking Truth and Open-mindedness Story Title: Suicide	View the story. Analyze the story. Training includes activities followed in class. Provide feedback. Home exercise.
	19	Analysis, methodology and confidence in logic Story Title: Inequality in Education	
	20	Curiosity and wisdom Story Title: Loss of Heritage Identity	
	21	Review of training on reasoning skill with habits of mind	
	22	Seeking Truth and Open-mindedness Story Title: Social Media Addiction	
Skill Six Training in Self-regulation skill	23	Analysis, methodology and confidence in logic Story Title: Exam Anxiety	
	24	Curiosity and wisdom Story Title: Authoritarian Ideas	
	25	Review of training on reasoning skill with habits of mind	
--------	26	Last meeting (closing session) on critical thinking skills and positive habits of mind According to the model (Facione & Gittens), and the application of the post-test	

Statistical analysis

To calculate the difficulty and ease coefficients and the degree of discriminatory power of the radical thinking test, the following procedures were used in the Statistical Package for the Social Sciences (SPSS) program.

Radical thinking test design

- The radical thinking test was applied to a stratified random sample selected from outside the basic research sample numbering 400 male and female students, and from the scientific and humanitarian disciplines, which is an appropriate sample.
- The response forms were corrected on the test, and the total scores were calculated and then arranged in descending order from the highest degree to the lowest score, and then determined the percentage of (27%) of the highest scores amounted to (108) forms and determined the percentage of (27%) of the minimum scores that amounted to (108) forms, and these percentages were adopted because they provide two extreme groups on the best possible size and differentiation of the phenomenon or characteristic subject to measurement (Dancey & Reidy, 2011), so the number of questionnaires that were analyzed statistically was (216).
- After determining the upper and lower groups, the coefficient of difficulty, ease and discriminatory strength of each position of the radical thinking test was calculated, using the (t-test) test for two independent samples, to compare the average scores of the upper group with the average scores of the lower group for each of the test positions, which numbered (40) positions. Those that obtained the calculated value (t) equal to the tabular value (1.96) or more, are distinct positions because they are statistically significant at the level of (0.05) and the degree of freedom (214). Table No. 7 shows this.

Reliability of the Radical Thinking Test

To extract the stability of the radical thinking test by the method of application and re-application, the researchers chose a random sample of 100 male and female students, and the test was applied on Wednesday, 8/11/2023, and it was reapplied again on 11/22/2023, on the same sample with an interval of 15 days, and the stability coefficient of the radical thinking test was extracted using the Pearson correlation coefficient to find the correlation between the scores of the two applications, and the degree of Pearson's correlation coefficient reached between the two applications (0.86). It is an acceptable level of stability. Accordingly, the test is ready for application.

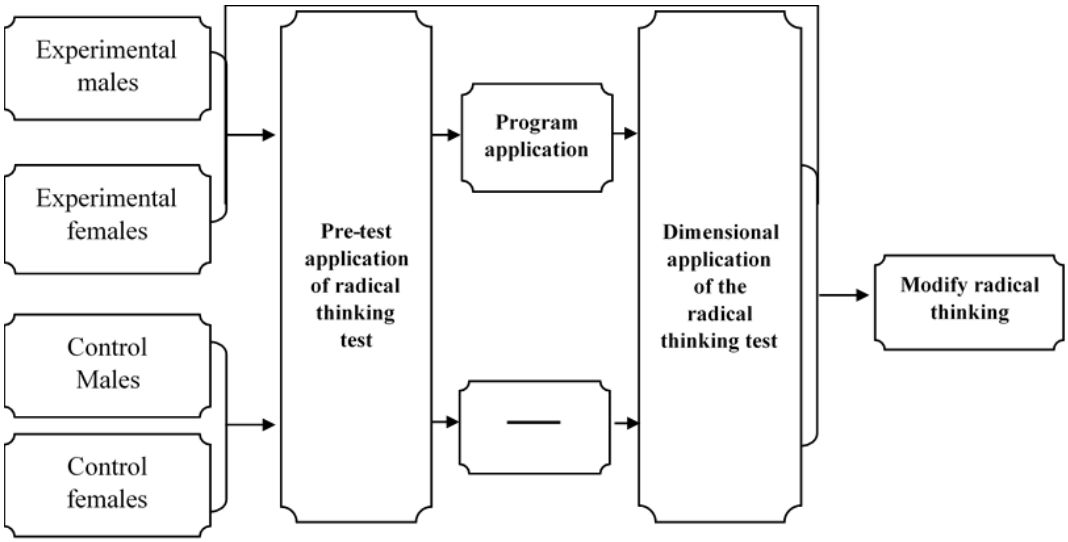
Experimental design

The researchers adopted the experimental design with experimental and control groups (equivalent) with pre- and post-measurement. The first experimental group consisted of 10

males, and the second experimental group consisted of 20 females. The two control groups consisted respectively of 16 males and 22 females. Figure 1 illustrates the experimental design.

Figure 1

Experimental design



Final application of the research tool

After determining the study community represented by the students of the University of Mosul and diagnosing the required sample. A sample was intentionally drawn from the College of Islamic Sciences—Departments of Sharia and Islamic Creed and Thought, second stage, and their number reached 68 male and female students as two experimental and control groups, with 30 experimental from the Department of Islamic Creed and Thought and 38 control from the Department of Sharia. Informed consent was obtained from all participants before the start of the experiment, as shown in Table 3.

Table 3

Distribution of the diagnostic sample to the experimental and control group

College	section	Group Type	Sex	Number
Islamic Sciences	Islamic Creed and Thought	Experimental	males	10
		Experimental	females	20
	Sharia	Control	males	16
		Control	females	22
Total				68

Equivalence procedures

Equivalence for experimental and control groups was achieved by: first, the pre-test of radical thinking; second, chronological age; third, students' academic achievement; and fourth, the economic level of the family. Table 4 shows the equivalence between the experimental and control groups in the pre-test.

Table 4

Equivalence between groups in the pre-test

Type of thinking	Group Type	Number	Arithmetic mean	Standard deviation
Radical	Experimental males	10	102.20	3.22
	Experimental females	20	103.10	3.65
	Ccontrol Males	16	101.75	3.00
	Ccontrol females	22	104.18	2.48
	Total	68	103.00	3.17

Ethical considerations

Ethical approval for this study was obtained from the University of Mosul, Ministry of Higher Education and Scientific Research, College of Education for Human Sciences, by Task Facilitation Letter No. 3/7/11436 dated October 30, 2023.

Results

First aimed: investigate the level of radical thinking by measuring its degree among university students

This aim was achieved through the application of the radical thinking test on the research sample members, which numbered 68 male and female students (pre-test for experimental and control groups), and the outcomes displayed after being treated statistically using a T-test for one sample were that the arithmetic mean of the sample members in the pre-test had reached (103), a degree, and a standard deviation of (3.17), and when compared to the hypothetical mean of the test of (80), it was found that the arithmetic mean is higher than the

hypothetical mean of the radical thinking test. The calculated T was (59.79), which is higher than the tabular T value of (1.98), at (5%) significance level with a degree of freedom of 67. Table 5 and Figure 2 show this.

Table 5

Arithmetic and hypothetical averages, standard deviation, calculated and tabular T-value of the research sample

No	Arithmetic mean	Standard deviation	Hypothetical mean	T-value		Significance level
				Calculated	Tabular	
68	103	3.17	80	59.79	1.98	function

Second aimed: determine the effect of the program in modifying radical thinking

To verify this objective, the researchers used (a t-test for paired samples) to compare the pre-test scores and the post-test scores for the two experimental groups only (10 males and 20 females), where the calculated t-value reached (14.12), which was higher than the tabular t-value of (2.045) at a significance level of (5%) and a degree of freedom of 29. Table 6 and Figure 3 show this.

Table 6

T-test results for two correlated samples on the radical thinking test

Audition	No.	Arithmetic mean	Standard deviation	The difference between the pre- and post-applications	T-value		Cohen's equation	Significance
					Calculated	Tabular		
Pre-test	30	103	3.48	23.23	14.1	2.04	2.57	function
Post-test		79.56	9.83					

Table 6 displayed that there is a statistically significant difference between the pre-and post-measurements and in favor of the post-measurement after the experimental group was exposed to the program, as the average post-measurement is less than the average of the pre-measurement on the radical thinking test among the members of the first and second experimental groups (males and females), i.e. there is a clear difference between the results of the pre-and post-measurements, and the decrease in the post-measurement is due to the effectiveness of the program and its effective role in modifying radical thinking, as the arithmetic average in the pre-test 103 after the application of the program sessions and the post-test application, the arithmetic mean was 79.56 as shown in Table 6.

To identify the effect size between the pre- and post-application of the first and second experimental groups (males and females), Cohen's equation (Cohen's d) was applied, and the correction calculation for Hedges' correction was applied to the correction cloud in the bias for the size of the effect, in order to reveal the credibility of the results obtained by the two researchers, as both (Al-Zahrani & Al-Amoudi, 2024) indicated that the size of the effect can be known by using the ETA square to measure the effect size of the independent variable on the dependent variable of the experimental group, and Cohen determined it The minimum contribution score for the presence of a large effect size is (0.14). (Al-Zahrani & Al-Amoudi, 2024). Table 6 displays the magnitude of the significant impact, indicating the program's effectiveness in modifying radical thinking.

Discussion

This study aimed to build a tool to measure the degree of radical thinking among students of the University of Mosul and to design a program based on the Facione & Gittens model to know its effect in modifying radical thinking. The construction sample consisted of (400) male and female students, from which an experimental and control sample was selected after diagnosis, numbering (68) male and female students. The study revealed through the sample's answers to the radical thinking test that second-year students possess radical utopian thinking. The study also revealed a clear and effective effect of the program designed according to the Facione & Gittens model in modifying radical utopian thinking among students.

Table 7

Difficulty and ease coefficients and discriminatory power of the radical thinking test items

Radical thinking test items									
No.	Difficulty coefficient	Ease coefficient	Discriminatory power	Calculated t-test value	No.	Difficulty coefficient	Ease coefficient	Discriminatory power	Calculated t-test value
1	0.44	0.56	0.52	6.921	21	0.43	0.57	0.48	4.886
2	0.45	0.55	0.43	5.324	22	0.63	0.37	0.56	8.389

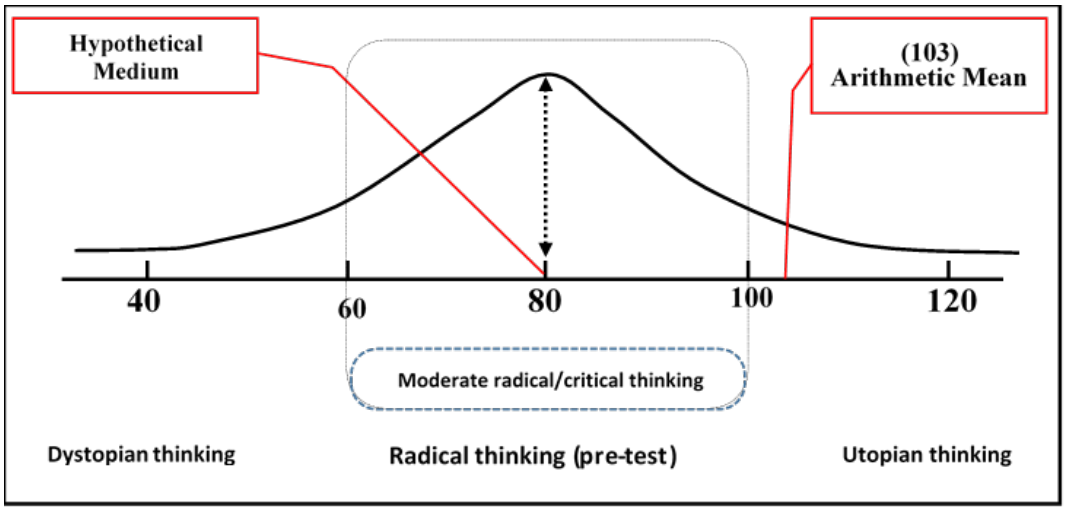
Radical thinking test items									
No.	Difficulty coefficient	Ease coefficient	Discriminatory power	Calculated t-test value	No.	Difficulty coefficient	Ease coefficient	Discriminatory power	Calculated t-test value
3	0.47	0.53	0.46	11.574	23	0.48	0.52	0.44	9.961
4	0.53	0.47	0.50	4.257	24	0.46	0.54	0.48	5.827
5	0.54	0.46	0.37	7.877	25	0.51	0.49	0.61	6.982
6	0.46	0.54	0.48	9.572	26	0.41	0.59	0.52	9.458
7	0.52	0.48	0.63	10.695	27	0.42	0.58	0.65	5.427
8	0.53	0.47	0.69	4.778	28	0.59	0.41	0.70	4.700
9	0.51	0.49	0.50	8.654	29	0.48	0.52	0.48	7.044
10	0.49	0.51	0.50	4.846	30	0.53	0.47	0.69	6.934
11	0.40	0.60	0.39	8.422	31	0.52	0.48	0.63	9.401
12	0.54	0.46	0.44	9.947	32	0.49	0.51	0.54	9.249
13	0.40	0.60	0.46	4.412	33	0.55	0.45	0.39	8.409
14	0.60	0.40	0.65	3.634	34	0.46	0.54	0.52	10.093
15	0.46	0.54	0.37	8.153	35	0.45	0.55	0.54	5.960
16	0.50	0.50	0.74	6.303	36	0.58	0.42	0.72	4.890
17	0.55	0.45	0.54	4.673	37	0.53	0.47	0.61	7.179
18	0.49	0.51	0.39	7.591	38	0.56	0.44	0.43	9.726
19	0.53	0.47	0.69	9.565	39	0.51	0.49	0.54	6.805
20	0.44	0.56	0.44	6.096	40	0.45	0.55	0.43	7.723

Regarding the results of the first objective, which is to identify the level of radical thinking among university students, the authors attribute this finding to the fact that utopian thinking, characterized by its idealistic vision of society, greatly influences the ideologies of university students. This form of thinking arises from a combination of idealism, hope, and a desire for change, providing a framework for clarifying ideals and envisioning a better future. It stems from the exploration of identity and values during adolescence, allowing young people to critique existing systems and propose alternatives. Engaging in global issues such as climate change and inequality fuels this thinking, as it offers solutions outside of Traditional frameworks. Thus, utopian thinking reflects a broader search for meaning, identity and contribution, shaping youth ideologies and community participation.

This result was consistent with the opinions of all of Linsbichler & Ivan, 2023; Hanna & Otto, 2022; Basso & Dario, 2022; Rieley, 2020; and Bal & Andy, 2022. Which was previously presented in the theoretical framework. Figure 2 show this.

Figure 2

The location of the scores of the sample members on the standard distribution curve in the pre-measurement

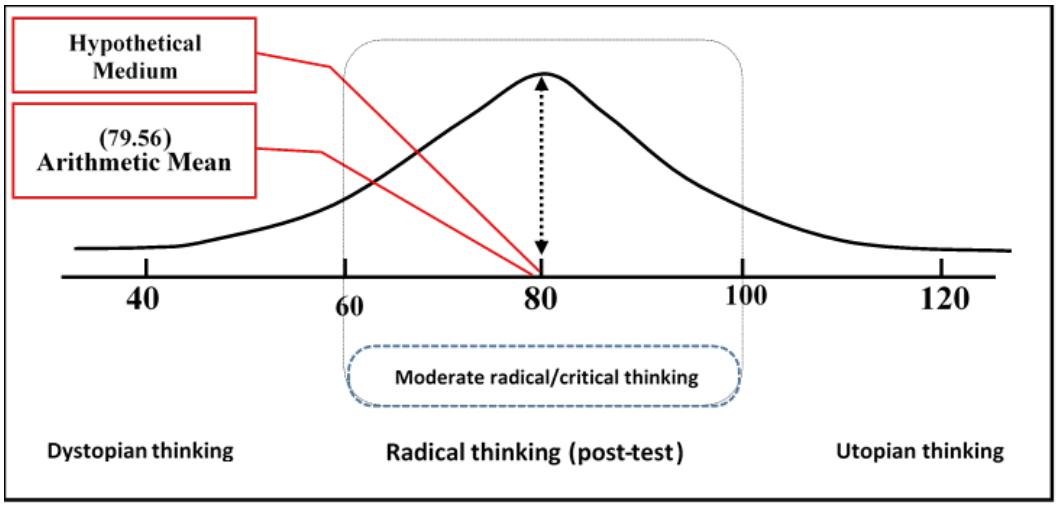


Regarding the results of the second objective, which is to determine the effect of the program in modifying radical thinking, this achievement is attributed to the structured approach, principles, strategies, and steps derived from the Facione & Gittens model, where the program made the members of the two experimental groups (males and females) more effective and active. in their collections. This environment fostered open dialogues, encouraged diverse perspectives, and allowed for the free expression of ideas. In addition, the researchers' methodology, which focused on student input, played a role in communicating program content and giving importance to their responses by providing reinforcement and feedback.

These results showed that critical thinking is a capacity that affects a person's future life. Since these skills make a person a good decision-maker. Critical thinking is important for students' futures, as it takes into account the fact that it prepares students to face many challenges that will arise in their lives, careers, and personal obligations and responsibilities (Sari et al, 2019). Figure 3 show this.

Figure 3

The location of the scores of the sample members on the standard distribution curve in the post-measurement



Conclusion

According to the outcomes, the authors came to several conclusions, including:

- The University of Mosul students possess radical thinking, which was revealed through the test that was built for this task.
- There is a clear and explicit difference between the results of the pre- and post-test in favor of the post-measurement, which is attributed to the role of the program.
- The program contributed significantly to modifying radical thinking among the University of Mosul students, which was reflected in the development of critical thinking skills and positive mental habits.

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Conflict of Interest Information

The authors have no conflicts of interest to declare.