Benefiting from the technologies of the Fourth Industrial Revolution in teaching the course of metalworks remotely

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introduction

The amazing progress in the technological innovations brought about by the Fourth Industrial Revolution of Hardware and Software has brought attention to what these technologies can do in all aspects of life in general and in the educational field in particular. The applications of the technology of the Fourth Industrial Revolution preserved unique opportunities to improve human communication and solve the problem of not providing time and space through its reliance on automation on the Internet. Some of these technologies have been used to provide a rich, enriching and attractive new learning experience. One of the leading applications of video and audio communication has been used, which is the Zoom platform for video and audio conferencing. In addition, many social media applications have been used to facilitate communication and exchange of information and files such as Facebook, Telegram, Whatsapp, and others.

In light of the current global developments from the outbreak of the Crohnovirus (Covid 19), the new disease that struck the whole world from its far reaches to Dania in December 2019, which led to stoppage or paralysis in all aspects of life, where all activities and areas such as economic, social, cultural and educational fields stopped. With the educational field stalled at all stages, it was necessary to search for alternative means to complete the teaching process in schools and universities, and go to the application of alternative educational mechanisms for traditional education, which has become impossible under the weight of the pandemic of the virus.

In light of this pandemic and with the necessity of completing the teaching process. The fourth industrial revolution capabilities, from applications and equipment, must be used through the activation of distance e-learning. The researcher has completed the teaching of minerals course (2) for students of the fourth year in the Department of Art Education - Faculty of Specific Education by taking advantage of the use of electronic distance education to achieve ways to communicate with sound and image and exchange information and files by default after it became impossible to deal physically.

Research problem: The research problem is determined in the following questions:

How can the technologies of the fourth industrial revolution be used to teach the course of metalworking remotely?

Research Objectives: This research aims to:

- Activating the role of the teacher of art education in directing the correct destination to benefit from the applications of the fourth industrial revolution technology.
- Teaching through e-learning via distance and achieving the desired goals of education and taking the student's hands all the time to work hard and fruitfully.

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• Create a positive trend for the student of the Faculty of Specific Education - Department of Art Education, and prepare a graduate of this community in the form and manner that enables them to interact with the data of this era.
• Professional development of teachers in line with the data of the digital age and its implications for education

Research hypotheses: The researcher assumes that:

To what extent can the technologies of the Fourth Industrial Revolution be used to teach the metalwork course, which needs actual communication from a distance?

The importance of research: The importance of research lies in:

• Find alternative solutions to the teaching process in the event that traditional methods falter.
• Establishing a culture of e-learning, especially from a distance, because of its organization and arrangement of educational material and displaying it in an interesting way.
• Encouraging the student to communicate remotely to receive knowledge and effective participation and gain information and experiences provided through the applications of the fourth industrial revolution technology.
• E-learning is one of the most important digitization challenges that must be worked on, as it is characterized by support and building a distinguished generation.
• Highlighting the importance of creating with Islamic art vocabulary to implement new metal metaphors.
• The current research is a new educational tributary from the tributaries of the electronic educational content remotely to teach metal courses.

Search limits: The current search is limited to the following limits

• Implemented in the second semester of 2019-2020
• The study is limited to the application of the research on a sample of students of the fourth year, a course of metalworking (2), Department of Art Education - Faculty of Specific Education - Menoufia University and they are (30) students.
• Metal artifacts have been implemented in different bodies of the hand woman, using manual forming techniques, which rely on the technique of pressing the metal and leveling the surface with lamination technology.
• Materials such as red copper and brass, 0.2mm thickness, aluminum foil, consumables of aluminum foil - plywood or MDF, used in precious and semi-precious stones, chemical oxidation.

Research methodology: This research follows the experimental and descriptive analytical method according to the following axes:

The first axis: theoretical framework: and includes
First: the technology of the fourth industrial revolution and e-learning via distance
• The role of a teacher of art education in the twenty-first century
• Teacher roles in the era of the technology of the fourth industrial revolution
• The Fourth Industrial Revolution, its challenges, importance, and obstacles.
• The use of digital communication technology in the education process:
• The philosophy of distance e-learning

Second: Inspiration from the vocabulary of Islamic art

- Technical features and plastic features of Islamic art vocabulary:
- Kinds of Islamic motifs.
- Aesthetics of Islamic art vocabulary and its role in building metal works.

The second axis: the practical framework and includes

- The stages that students have gone through.
- Presenting practical applications, starting with models of units, then designs on paper, then ending with implementing works to define methods, approaches, design and technology for students in the research sample.

The third axis: It presents the researcher's findings of the results and the work of a statistic to measure the arbitration of the arbitrators' opinions and recommendations.

The first axis: theoretical framework

First: Technology of the Fourth Industrial Revolution and e-learning via distance

The Fourth Industrial Revolution

The Fourth Industrial Revolution, with its offering of technologies and solutions in various fields, has contributed infinitely to connecting billions of people to the web to improve human communication, and radically improve the efficiency of business and institutions. That is why we had to take advantage of modern technologies, including the applications of the Fourth Industrial Revolution in remote e-learning and the transfer of educational reality from physical reality to fields where interactive environments and remote communication receive knowledge and effective participation between members of the educational process. Where the fourth industrial revolution is the name that the World Economic Forum in Davos, Switzerland, launched in 2016 on the last episode of the series of industrial revolutions that started with the first industrial revolution that was characterized by the proliferation and replacement of manual work in the city, and then this revolution is a major break with a long history consisting of a lifestyle and production And primitive relations lasted for thousands of years to different conditions.

The use of the applications of the technology of the fourth industrial revolution is of great importance in developing the educational process of universities, especially in light of the current situation of the outbreak (Virus Krona Coffed 19), commitment to the home and societal divergence, all of which had the greatest impact in replacing traditional education with the integration of digital technology into education where It increases the interaction between students in exchanging information and obtaining it easily, and there are many technological means that the researcher used in remote e-learning in teaching the course of metal works, starting with the use of smart phones, the presence of the Internet with each individual, and the use of different social media , As used in that research.

Distance e-learning

E-learning is one of the recent trends in the education system that has spread and developed and transformed from a mere imaginary idea into a scientific reality, due to the scientific techniques that changed the methods of education and led to the creation of an electronic learning environment that depends on the employment of applications of technological innovations the fourth industrial revolution with a view to providing Education at a time for whoever wants it and in any place that suits the circumstance of "e-learning" is an educational style that provides

a high-level educational service for the field of metal works in terms of efficiency and effectiveness and free from stereotypes and traditional in education.

The importance of e-learning.

• It provides an interactive learning environment between the student and the teacher and between the student and colleagues outside of formal study hours, ease of assessment and providing feedback.

• It provides an educational environment in which experiences are far from risks. It is characterized by flexibility in space and time and in an atmosphere of privacy.

• The learner can learn without committing to a specific age. He encourages the learner to continue education throughout life.

• Ease of updating websites via the Internet, and the ability to obtain knowledge and science easily and visually.

• Large numbers of students can be taught, discussions and opinions expressed, giving freedom and audacity to express ideas.

As e-learning is a good opportunity for individuals to use time and distance learning and achieve what develops their capabilities and develops them for the better so that it cope with the era in which we live in light of the rapid progress of technology, the fourth industrial revolution and developments in information and communication technology, and also depend on them in all our scientific and social lives within society . Given all the conditions that all countries of the world, especially Egypt, are going through, it became necessary when planning future education "to take into account the professional development of teachers in line with the data of the digital age and its implications for education ".

Second: Inspiration from the vocabulary of Islamic art

The Muslim artist has achieved great success in the decoration on the metal artifacts, and it was necessary to draw inspiration from them to revive these arts and benefit from them and present them in a contemporary way and highlight the aesthetic and utilitarian value, for our contemporary world is full of artifacts that lack an aesthetic sense and originality. This research aims to show creative values and employ them in the field of metal works and to limit some of the techniques used by the artist in Islamic civilization, and few craftsmen and craftsmen still work with them. The researcher is trying to teach her students ways to draw inspiration from the vocabulary of Islamic art using push technology from the back or pressure on the metal and provide some educational sites through YouTube, as this course is taught via e-learning via distance. Through the teaching of the course, the researcher is exposed to clarify the most important characteristics of Islamic art vocabulary, which formed a unique and distinct pattern, and these Islamic decorative vocabulary such as Islamic engineering motifs, Islamic animal and animal motifs, and Islamic plant motifs.

The methods and performance methods applied by the Muslim artist on many surfaces of his material

First: Robesian, "pressing the metal repousee

The French dictionary defines "prominent and recessed" as a French term meaning that it is a work that uses a hammer or a chisel on a thin piece of metal in order to obtain the result of decoration on the piece.

This technique is one of the techniques that do not need many tools in the formation, as these tools can be shortened to a group made of aluminum, wood, lemon, bone, spoon or empty pens, and the pressure on the metal to achieve eminence and gaining, whether alone or jointly with jealousy, It is one of the techniques for metal formation that provides an opportunity to develop the practitioner's ability to photograph and visualize.

Second: Lamination with minerals on wood.

Lamination is intended to cover the surface with foils (sheets) of metal in order to give it a kind of strength, durability and aesthetic value. Many processes of lamination take place on wooden surfaces, for easy access to it and the possibility of a variety of manual methods often available.

The second axis: the practical framework

In teaching her to the fourth year students who specialize in artistic education (minerals working with minerals 2), the researcher relied on electronic distance education, in view of the circumstance that all countries of the world go through (Virus Krona The Newcomer - Covid 19), including Egypt. Study and by taking advantage of the applications of the fourth industrial revolution technology in teaching such as the Zoom program, and social media such as WhatsApp and Facebook to teach this course. The researcher also relied on taking advantage of the aesthetic values in the vocabulary of Islamic art of all kinds, which was inspired by them to make multi-use metal artifacts such as hand mirrors and stand mirrors for the office, which relied on its formation on several axes, each of which complement each other:

The first axis: Depends on the formal diversity of the vocabulary of Islamic art, which consists of metalwork and its aesthetics.

The second axis: It depends on the structural systems in the vocabulary formations of Islamic art, whether organic or engineering.

The third axis: It depends on the methods and performance methods applied by the Muslim artist on many raw surfaces, whether it is by leveling the surface through the technique of laminating with metals on the wood or by pressing the metal or brussiness technique to vary the surface levels of gummy and prominent, where the correct use of the technology and the raw material One of the important things to achieve aesthetic and functional visions in the formation of contemporary metalwork.

Therefore, the metalwork and the various bodies have come out to form (hand mirrors or stand mirrors on a desk), from their traditional framework to contemporary bodies, and surface treatments have become an inseparable part of the general construction of the metal surface. In terms of combining techniques, whether pressing metal or leveling the surface with lamination technology on wood with metal. To complete the finishing process of the metal works, this does not mean that the attention is focused on the aesthetic aspects and the omission of the use aspects, but it is possible to achieve both things together, meaning that a metal works can be designed with the aim of highlighting the expressive side and the aesthetic and technical side as well as the functional value.

The students were divided into two groups and a group was created for each group and a teacher is responsible for it and a student from the group then the teacher displays examples of decorations from Islamic arts, whether organic or engineering, then help students in making some designs with bullets, review them, correct them, then return them to the students, then work on evaluating the design with lead Then he presented an educational video to explain how to transfer and define the design from paper to metal, as in the figures (1:8).

The process of flattening the metal according to the formation processes with plating technology, which is the integral of the forming process by pressing the metal, which contains several assortment processes such as deletion and addition according to the processes of overlap, overlap and interlocking of some vocabulary of Islamic art, such as branches, plants, stems and varieties of different sizes and varieties in texture. Where the processes of forming by pressing the metal played an effective role in highlighting the groin and the protruding and showing the aesthetics of the shape and the ground while eating the aesthetics of color inlaid

Figures (1:8)

with precious and semi-precious stones in some artifacts. Through good finishing and appropriate output of the occupied metal work with aesthetic visions and surface treatment with cleaning and chemical oxidation. Students carried out many metal works in different bodies for the shape of hand mirrors, including Maria stand on desk, and below shows all applications as in Figures (9:26)

Figure (11) **Figure (10)** **Figure (9)**

Figure (14) Figure (13) Figure (12)

Figures (15:20)

Figure (21) Figure (22)

Figure (23) Figure (24) Figure (25) Figure (26)

The third axis: Results related to the statistical study of the questionnaire, the arbitration of student applications.

Search results:

The hypothesis states that to what extent (the extent to which technologies of the fourth industrial revolution can be used in teaching the course of metal works that needs actual communication remotely) and to verify the validity of this hypothesis came the first axis of the questionnaire for the arbitration of applications entitled the extent of achieving the design elements in the metal work and included Three items to measure the degree of achieving that hypothesis in the students' applied experience, and by calculating the arithmetic averages of the first axis clauses for all arbitrators, we find that they came at a rate of (84.16%) approximately, as shown in Table (1). In order to achieve the validity of the second axis of the questionnaire of arbitration applications, entitled The extent of benefiting from the motifs of Islamic art as a source for quotation and inspiration, and it included three items to measure the degree of achieving that imposition in the applied experience of students, and by calculating the arithmetic mean of the items of the second axis of all arbitrators, we find that it came in (80.06%) Almost, which confirms the success of the applied experiment for research in achieving authenticity, providing new visions, and adapting Islamic motifs as a source of quotation, as shown in Table (2). To achieve the validity of the third axis of the application arbitration questionnaire, entitled The extent of achieving technical and aesthetic values and the integration of the techniques implemented in the metal works, and it included three items to measure the degree of achieving this hypothesis in the applied experience of students, and by calculating the arithmetic mean of the items of the third axis in all arbitrators, we find that it came in a rate of (85.4) %) Approximately, which confirms the success of the applied experiment for research in achieving the technique of pressing the metal from the back and varying its levels as shown in Table (3). To achieve the validity of the fourth axis, Extent of Benefit from the Applications of the Fourth Industrial Revolution, and included three items to measure the degree of achieving that hypothesis in the applied experience of students, and by calculating the arithmetic mean of the fourth axis items for all arbitrators, we find that it came about (89.86%) approximately as It is shown in Table (4).

Table No. (1) Summary of average estimates and percentages for the first axis items of the arbitrators

	Axis items	The average	The ratio	Appreciation
1	Achieving the ratio and proportion among the	4.55	91	Excellent

Table No. (2) Summary of the average estimates and percentages for the second axis items for the arbitrators

	Axis items	The average	The ratio	Appreciation
1	The source of the quotation is inspiring and comprehen	4.13	82.6	very good

	elements of the units used			
2	Achieving innovation and innovation in the implemented designs	4.02	80	very good
3	Achieving the relationship between aesthetic and functional value	4.32	86.4	very good

	sive, and the product has achieved its purpose			
2	Achieve authenticity by introducing new and unconventional insights	4	80	very good
3	Customizing Islamic motifs to serve the aesthetics of wrought metal	4.27	85.4	very good

Table No. (3) Summary of average estimates and percentages for the third axis items for the arbitrators

	Axis items	The average	The ratio	Appreciation
1	Metal push back technology achieves texture effects and surface levels variation	4.56	91.2	Excellent
2	Lamination technolo	4.28	85.6	very good

Table No. (4) Summary of the average estimates and percentages for the fourth axis items for the arbitrators

	Axis items	The average	The ratio	Appreciation
1	Distance learning via e-learning has an effective effect in the teaching of metalworking course 2	4.63	92.6	Excellent
2	It brings flexibility	4.65	93	Excellent

	gy integrates the technology of pressing the metal from the back			
3	Achieves color aesthetics through inlay or oxidation	4.01	80.2	very good

	in providing alternatives to teaching in new ways			
3	Students respond to electronic teaching methods remotely	4.22	84.4	very good

And an indication of the success of the experiment on the level of all students and equal opportunities in receiving and applying, all the court applications received very good estimates and slight variation and an average of 86.14 to confirm what leaves no doubt about the integrity of the idea and the accuracy of implementation and the quality of the outputs as shown in table .(5)

Table No. (5) shows the average estimates and percentage of applications for the arbitrators

Arbitrators / Applications	1	2	3	4	5	6	7	8	9	10	The average	The ratio	Appreciation
Application 1	4.8	4	4.3	4.4	3.6	4.4	3.8	4.2	4.8	3.8	4.21	84.2	very good
Application 2	4.8	4.2	4.4	4.5	4	4.5	4	4.3	4.8	3.9	4.34	86.8	very good
Application 3	4.9	4.2	4.3	4.5	4.2	4.5	4.2	4.1	4.9	4.2	4.4	88	very good
Application 4	4.9	4	4.9	4.5	4.3	4.5	4.3	3.8	4.9	4.3	4.44	88.8	very good
Application 5	4.8	4.3	4.5	4.5	3.6	4.5	3.6	4.3	4.8	3.6	4.25	85	very good
Application 6	4.8	3.8	4.5	4.5	4.1	4.5	4.1	3.8	4.8	4.1	4.3	86	very good
Application 7	4.9	4	4.2	4.5	3.8	4.5	3.8	3.8	4.9	4	4.24	84.8	very good

Application 8	4.8	3.9	4.3	4.5	4	4.5	4.2	4.1	4.8	4.1	4.32	86.4	very good
Application 9	4.8	4.2	4.3	4.5	4.5	4.5	4.6	4.3	4.8	4.6	4.51	90.2	very good
Application 10	4.8	3.5	4.4	4.5	3.6	4.5	3.5	3.6	4.8	3.7	4.09	81.8	very good

Analysis and interpretation of the results:

In light of what the researcher addressed in the theoretical, applied and statistical framework, the following are the most important results that the researcher has reached through research and experimentation.

First: the results:

- Results related to the extent of achievement of design aesthetics in the metal work.
- Results related to the extent of benefiting from the vocabulary of Islamic art.
- Results related to the extent to which technical values are achieved through technical methods of implementing metal works.
- Results related to the extent of utilization of e-learning via distance applications.

First: Results related to the extent of achieving aesthetics of design in the metal work

- The researcher concluded that the vocabulary of Islamic art includes the largest number of vocabulary that carries many streamlined and flexible lines and that there is a correlation between the ratio and proportion between the elements of the units used.
- The researcher concluded that the multiplicity of external and internal bodies can be invested and work to innovate and renew in designs implemented from them.
- The researcher concluded that there is a relationship between the aesthetic and functional value of the metalwork, which is inspired by the vocabulary of Islamic art.

Second: Results related to the extent of benefiting from the vocabulary of Islamic art

- The researcher concluded that the Muslim artist was a success in the decoration of the metal artifacts, and it is necessary to draw inspiration from them to revive these arts and benefit from them and present them in a contemporary way as it is a source of inspiration to achieve the product's purpose.
- The researcher concluded that our contemporary world is full of artifacts that lack an aesthetic sense and originality. This research aims to show creative values and employ them in the field of metal works and limit some of the techniques used by the artist in Islamic civilization, which achieves originality by providing new and unconventional visions.
- The researcher concluded that it is possible to adapt the vocabulary of Islamic art, and pay attention to it because of its linear values that can be aesthetically invested as it is expandable, overlapping and intertwining among them and it can be controlled and directed in a manner that is appropriate to the design of the metal works

Third: Results related to the extent of achieving the technical values through the technical methods of implementing the metal works.

- The researcher concluded that the technique can be formed by pressing the metal from the back by highlighting the gummy and the protruding, the variation of the surface levels and the diversity of the concrete effects.
- The researcher concluded that the formation technique with lamination technology to flatten the metal, as this method is integral to the formation process with the technique of pressing the metal from the back to the side, as it can be implemented by methods with simple and different manual tools that help the designer to achieve ideas in the form of multiple topics and vocabulary between engineering and plant vocabulary.
- The researcher concluded that the aesthetics of color lie according to processes of formation by inlaying precious and semi-precious stones or by the chemical oxidation of the aesthetic strength that reflects the aesthetics of the relationship between shape and floor.

Fourth: Results related to the extent of benefiting from the e-learning applications via distance.

- The researcher concluded that the distance learning via e-learning achieves an effective effect in the teaching of the metalwork course (2) where the graduate student can then learn without committing to a specific time age as it encourages the learner to continuously teach throughout life. Anytime, anywhere, access to knowledge and science is easy, visual or audio.
- The researcher concluded that through teaching the course of metal works (2) from a distance, through the applications of the fourth industrial revolution where flexibility in providing scientific material and appropriate alternatives in teaching and the availability of an interactive learning environment between the student and the teacher and between the student and colleagues, the learning is no longer rigid but flexible.
- The researcher concluded that students have responded to electronic learning methods remotely through the availability of programs and applications that facilitated ways to communicate with the teacher during official study times or outside the official study times, and the ease of evaluation and providing feedback.

Recommendations and proposals

- The researcher recommends adopting the teaching line designed in this research as a model for activating electronic distance education in the field of metal works and also in other specializations in the field of art education.
- Revive the artistic and aesthetic values of Islamic arts by designing educational programs and decisions to preserve Arab heritage.
- The researcher recommends the need to continue to pay attention to artistic heritage as a starting point for development and modernization in the field of art, especially in the field of metal works
- The researcher recommends that the public should be started, especially university officials and the Department of Education, on the importance of arts and art education in the educational process system through designing and implementing educational lectures and workshops for this purpose.

• Developing universities to be a better place for work and education by giving greater professional independence and leadership powers to teachers.
• Educational strategic planning for renewing teacher preparation and education programs in university and pre-university education to keep pace with the developments of the times and the requirements for achieving the 2030 vision.

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