

# **The Jordanian Teachers' Resistance to the Use of the Fingerprint Attendance System: Critical Analysis and Resolution From an Educational Leadership Perspective**

**Rami Abdullah**  
**Alain University**

*This paper aimed to present a critical analysis from the educational leadership perspective for the Jordanian teachers' resistance to use of the fingerprint attendance system and tried to identify the reasons of this issue and provided a group of recommended resolutions. This paper also reviewed the related theories, models, and approaches to support the process of explanation and discussion. Furthermore, This paper identified four themes during the discussion about the reasons behind teachers' resistance to use of the fingerprint attendance system, these themes are: The Jordanian MOE did not follow the required strategies and procedures to implement the intended change successfully, and to avoid or overcome the resistance of teachers, The ambiguity about the reasons behind intended change and the reasons behind teacher's resistance, The MOE did not consider the principles of rationality while making the decision of change and The MOE did not consider The TMA before using this of new technology. Furthermore, this paper recommended presented theoretical underpinning and models, and satisfactory and helpful for both the decision makers and teachers.*

*Keywords: leadership, Jordanian teachers resistance, a critical analysis, fingerprint attendance system*

## **INTRODUCTION**

### **Background**

The Hashemite Kingdom of Jordan realized that the educational reform is the soul of the country development since it can improve the capabilities of the human resources and bring a better socio-economic status for the Jordanian people. Therefore, the Jordanian Ministry of Education (MOE) started to utilize the new technology at its public school by operating "the electronic networking project" on 30 October 2017 as a new step for achieving the desired educational reform. According to The Jordanian Minister of Education, this project will contribute to solving many issues related to the educational field and enhance the performance of all educators (Jordan Times, 2017).

On the other hand, the electronic networking project led to a massive change in the process of tracking the attendance of MOE staff by using the fingerprint Attendance System. According to Harper (2011), the fingerprint Attendance System is one of the biometric technology that depends on the fingerprint as a physiological feature to identify the identity of personnel (Gningue et al., 2022).

On 20 February 2018, the Jordanian MOE announced that all teachers and staff should start to use the fingerprint attendance system as a method to prove their presence and punctuality. As a result of this decision, the majority of the Jordanian teachers refused to use this technology, and they escalate this issue

through the Jordanian Teachers' Syndicate. This refusal shifted into resistance among teachers (Alrai, 2018).

Recently, A qualitative study conducted by Abdallah (2018) about “Teachers' perceptions of the use of the Biometric Attendance System at Jordanian Schools.” The study utilized the semi-structured interviews as data collection method, and showed a negative impressions among teachers about this technology because of these reasons: this technology is not beneficial for the learning and teaching environment, the Jordanian MOE did not consider the nature of schooling before operating such technology , the majority of teachers are disappointed because they did not participate in planning phase in order to provide their real-world experiences and problems, and the participants explained that the decision of using the Biometric Attendance System is unfair because it can be operated within the rented schools. As for the advantages of this technology, the study indicated that this technology could help the Jordanian MOE to overcome the phenomena favouritism, decrease the wasted time in manual attendance tracking, and improve the payroll process. In contrast, the disadvantages of this technology includes adding a feeling of pressure on teachers as they work under monitoring, the existence of diverse technical problems among teachers related to operating this technology, the requirement for a vast amount of financial resources, the contradiction between the software of this technology and the regulations of personnel affairs department at the Jordanian MOE, and the favouritism and the misuse of this technology (i.e., it is possible that some principals will allow some teachers who live at the school neighbourhood to punch in and out while they are absent).

Additionally, the study revealed a group of personal, social and professional obstacles that related to the use of the Biometric Attendance System at the Jordanian Schools. The teachers mentioned that such system is not flexible to respond to the emergency leave cases or the teachers' delay because of the traffic congestion. Also, teachers stated that it is difficult for them to fingerprint when they do some external works such as professional development training or exams observation.

Besides, the last five years witnessed a series of turmoil in the relationship between the Jordanian Teachers' Syndicate and the MOE. The main reason that related to this turmoil is the salary increment and the allowances which teachers requested. Consequently, the MOE announced that it would respond to the demands of teachers as a procedure to reduce the severity of the clashes with teachers. On the other hand, teachers did not gain what the MOE promised, and they consider that as procrastination. (Alrai, 2018).

Thus, this paper will present a critical analysis from the educational leadership perspective for the Jordanian teachers' resistance to use the fingerprint attendance system and will try to identify the reasons of this issue through reviewing the available information such as newspaper articles, studies or the statements of the Jordanian Teachers' Syndicate, in order to come up with a group of recommended resolutions based on the educational leadership models and theories (Hamad et al.,2022).

### **Rationale for the Paper**

The writer of this paper selected the current topic because it is relevant to the module of theories and practices of leadership in education. Moreover, the issue of the Jordanian teachers' resistance to using the fingerprint attendance system is still new among the Jordanian public schools which required more study and analysis from the educational leadership perspective to enable the MOE decision makers to recognize the needed circumstances to run this technology successfully (Jarrah et al., 2020). Furthermore, the writer as a Jordanian educator has a Personal interest in this topic since it became a debatable issue, and he wants to contribute to providing more clarifications about it concerning reasons and solutions. Besides, the writer needs to learn as a Ph.D. scholar in educational management, leadership, and policy about the required considerations for implementing a new change in any educational organization and how to tackle the resistance.

### **The Main Objective and the Questions**

The main objective of this paper is to present critical analysis and resolutions from an educational leadership perspective regarding the issue of The Jordanian teachers' resistance to the use of the fingerprint Attendance System. Therefore, the paper will review the related theories, models, and approaches to support

the process of explanation and discussion. Accordingly, the following two questions will guide this critical analysis:

*Q1: What are the reasons for The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the perspective of the educational leadership?*

*Q2: What are the recommended resolutions to overcome The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the perspective of the educational leadership?*

### **Organization of the Paper**

This paper has been organized to include the following sections: the title page, the abstract, the introduction, the body, the discussion and analysis, the recommendations, and the conclusion.

The title page of this paper will enable the reader to understand the primary focus, the context and the case of the current paper. Moreover, the abstract will present a general summary of the main aim and conclusions of this paper. The introduction of this paper is to provide general background about the case, the rationale behind selecting this topic, and the main objectives. The body of the current paper will draw the theoretical underpinning from the educational leadership perspective and explain all related theories, models, and approaches that will be used to support the analysis and discussion of this paper. After that, the discussion and analysis section will provide an explanation and interpretation to the current case in light of the theoretical underpinning, and it will provide answers to the first question about the reasons of The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the perspective of the educational leadership. Furthermore, the recommendations and resolutions section will answer the second question of this paper and will present helpful information for the decision makers to overcome The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the perspective of the educational leadership. Finally, the conclusion of this paper will sum up the essential elements, circumstances reasons, and resolutions of the current paper.

## **THEORETICAL UNDERPINNINGS**

### **The Forces Toward Change**

Understanding the forces that drive the change is substantial for the educational leaders in terms of promoting the change or handling with resistance among their educational organizations. Generally, the external and internal forces are the two main types of forces for change. The external forces for change refer to the outside factors such as technology, economic situations, and legislation. While the Internal forces for change exist inside the school's environment as the inefficiency of administrative procedures and the difficulty in achieving the job satisfaction for the staff (Fullan, 2001).

Moreover, educational leaders need to comprehend the reasons behind change resistance. Many scholars indicate that people probably resist change because of uncertainty about the coming change, concern over the personal loss, the nature of the groups' norms, the individuals need for dependence, lack of trust in leaders and awareness of weaknesses in the proposed change. (Jones, 2003; McMillan 2004).

### **Strategies to Overcome Change Resistance.**

As the proposed change could not occur instantly, the educational leaders should understand the nature of change precisely. Fullan and Miles (1992) mentioned that leader should contemplate the following seven primary themes to implement the proposed change successfully: (a) Change is learning. (b) Change is a journey, not a blueprint. (c) Problems are our friends. (d) Change is resource-hungry. (e) Change requires the power to manage it. (f) Change is systematic. (g) All large-scale change is implemented locally.

The educational leaders need to recognize their required tools to tackle the resistance to change wisely and systematically. Lunenburg & Irby (2005) identified a group of procedures which can support the leaders while they are overcoming the resistance to change, these procedures are education and communication,

participation and involvement, facilitation and support, negotiation and agreement, manipulation and cooptation, explicit and implicit coercion.

What is more, Lunenburg & Irby (2005) summarized the phases of successful change which include: pressure and arousal to change, intervention and reorientation, diagnosis and recognition, invention and commitment, experimentation and search, and reinforcement and acceptance.

### **The Role of Leader in Change and Decision Making (Minister of Education as Educational Leader).**

It is crucial for the effective leader to adhere to the principles of rationality while deciding to change, to reinforce the effectual application of change. Robbins (2004a) specified the elements of rational decision making for leaders as follows: clarity of the problem, goal orientation, knowing all available options, clear preference, constant preference, no time or cost constraints exist and maximization.

The complicated nature of change obliges the leaders to follow a well-organized framework which can enable them to lead during the challenging stages of change. To support the achievement of positive change, Fullan (2001) presented a Framework for Leadership that consists of five components: first, moral purpose through working toward positive difference for all involved parties. Secondly, understanding all circumstances of change. Thirdly, building and developing the relationships between diverse individuals and groups. Fourthly, sharing knowledge. Fifthly, coherence making. Fullan (2001) confirmed that each of these components is independent, but all of them overlap to promote the successful change.

### **The Role of Educational Leaders When Using a New Technology**

As we live in the era of technology, educational leaders should know the considerations of utilizing new technology. Therefore, Davis (1989), through designing the technology acceptance model TMA, assumed that the users' acceptance of new technology related to their perceptions about its usefulness and ease of use. The TMA explains why users may amend their behaviors to become more suitable to the new technology.

## **DISCUSSION AND ANALYSIS**

This section will provide critical analysis about the reasons of The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the educational leadership perspective, and connect that to the theoretical underpinning of the current paper. The writer of this paper utilized the reflection and discussion to present a profound explanation to the current issue, and use the relevant literature to defend his point of view.

### **The Themes**

After reviewing the background of the current paper and all available information, the writer could conclude a group of themes which can explain the reasons of The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the perspective of the educational leadership. Therefore, this discussion will include the following themes:

1. The Jordanian MOE did not follow the required strategies and procedures to implement the proposed change successfully, and to avoid or to overcome the resistance of teachers.
2. The ambiguity about the reasons behind the proposed change and the reasons behind teacher's resistance.
3. The MOE did not consider the principles of rationality while deciding on the change.
4. The MOE did not consider The TMA before using this new technology.

*Theme 1: The Jordanian MOE did not follow the required strategies and procedures to implement the proposed change successfully, and to avoid or to overcome the resistance of teachers.*

In light of the theories and models of educational leadership that have been mentioned in this paper, it is undeniable that the Jordanian MOE did not consider in advance the required precautions that can avoid

the resistance of teachers to the use of the fingerprint Attendance System. As explained before, the phases of successful change should include pressure and arousal to change, intervention and reorientation, diagnosis and recognition, invention and commitment, experimentation and search, and reinforcement and acceptance (Lunenburg & Irby, 2005). Consequently, I believe that the MOE did not go through these phases gradually and rushed in utilizing the fingerprint Attendance System. In my point of view, The Jordanian MOE did not expect the resistance of the teachers and assumed that the required change could take place instantly. However, Fullan and Miles (1992) confirmed that change as a systematic process required more patience and perseverance, and leaders must suppose the presence of problems all the time.

Furthermore, the Jordanian MOE delayed in utilizing the strategies of overcoming resistance before the escalation from the Jordanian Teachers' Syndicate. Lunenburg & Irby (2005) Suggested that education and communication, participation and involvement, facilitation and support, negotiation and agreement, manipulation and co-optation, and explicit and implicit coercion can support leaders while they are overcoming the resistance to change.

According to the Jordanian Teachers' Syndicate, the Jordanian MOE did not conduct any meetings with districts, school principals or teachers to give them an explanation about the fingerprint Attendance System before operating this new technology at the schools. Moreover, the Jordanian MOE did not give the teachers the real opportunity to explain their actual problems and obstacles among their schools as it can negatively impact the efficiency of using the fingerprint Attendance System (Alrai, 2018). I do agree with this point of view because every context has its own situations and listening to comments and perceptions of educators can be beneficial. Besides, the Jordanian teachers will not resist the idea of using the fingerprint Attendance System if they received a clear clarification about the need for this change and its advantages. Using the fingerprint Attendance System can support the processes of the human sources department such as tracking and controlling the staff attendance, writing the annual appraisal of the employee and provide a reliable data for payroll section (Oloyede, Adedoyin, Adewole, 2013).

Moreover, I think the absence of teachers Participation and Involvement in making the decision using the fingerprint Attendance System increased their refusal and resistance because they feel that the MOE ignored them (Abdallah, 2018). According to my experience as Jordanian educator and citizen, the Jordanian people did not accept to be ignored and excluded, and they considered that as a matter of dignity. Therefore, the MOE could avoid the resistance of teachers by allowing them to be part of this change.

Furthermore, the Jordanian Teachers' Syndicate stated that teachers required more Facilitation and Support to tackle their difficulties while using this technology. The teachers need a specialized and accessible department within the MOE that can receive and solve their related issues to the fingerprint Attendance System (Alrai, 2018). Several studies confirmed the existence of some challenges when using the fingerprint Attendance System, and these challenges may differ according to the context (Kirmani, 2017; Clavereau 2012). Furthermore, solving the attendance issue for the employees can enhance their productivity (Kadry&Smaili, 2013).

One more strategy missed by the Jordanian MOE which can decrease teacher's resistance is negotiation and agreement. The lack of discussion and the agreement on solutions that can satisfy all parties made the teachers' resistance more complicated. I believe that Teachers are less likely to resist the use of the fingerprint Attendance System if the MOE negotiate this matter with teachers to connect that to the salary increments or any other types of incentives. Rebores (2010) indicated to the effect of incentives on the individual discipline and motivation.

As the art of leadership assumed that leaders should be flexible, I think that the Jordanian MOE also did not employ the strategy of manipulation and cooptation properly. The manipulation can enable the decision makers at MOE to select the suitable time and personnel to distribute the information about the intended change and accomplish this mission successfully. While cooptation includes assigning the teachers who lead the resistance to play a significant role in change decision making. I think the time of announcing the decision of using the fingerprint Attendance System represents an excellent opportunity for the Jordanian Teachers' Syndicate to start practice the pressure on the MOE to get the salary increment and the allowances.

What I conclude from the decision of the MOE about using the fingerprint Attendance System is that the MOE utilize directly the strategy of explicit coercion which not suitable for the Jordanian educational field without the gradual use for the other strategies. From the educational leadership perspective, the coercion can be used only when all other strategies did not effectively overcome the resistance and when the priority of work required the implementation of an immediate change.

*Theme 2: The ambiguity about the reasons behind the proposed change and the reasons behind teacher's resistance.*

Due to the absence of the communication and discussion between the Jordanian MOE and the Jordanian Teachers' Syndicate, the MOE lost the chance to persuade the teachers about the importance of the proposed change and to identify the real reasons behind teachers' resistance to using the fingerprint Attendance System.

From educational leadership, it is essential for the leaders to recognize the external and internal forces for change before the implementation of the change. The internal forces are related to all issues and situations that exist within the school such as teachers' job dissatisfaction or the necessity of modifying the administrative processes. In contrast, the

The external forces for change can occur outside the schools, but it forms a real pressure on the school environment such as the current financial situation and the continuous development of technology (Fullan, 2001). In the current case, I think the Jordanian MOE aware about the purpose of the change regarding the external and internal forces for change, but lack of sharing information with teachers leads to the resistance. I believe teachers want the openness of the MOE to answer the following questions: why we need this system? How much will it cost the government? Is it only the choice for the MOE without any other alternatives? What about the shortage of financial resources in the MOE? Who is accountable in case of the inefficiency of this system? How to protect this project from financial corruption? How we can confirm the quality assurance of this system?.

Besides, the absence of communication and discussion between the Jordanian MOE and the Jordanian Teachers' Syndicate caused also the problem of ambiguity about the reasons behind teacher's resistance. Teachers may resist the change because of many reasons such as uncertainty about the coming change, concern over the personal loss, the nature of the group's norms, the individuals need for dependence, lack of trust in the leaders and awareness of weaknesses in the proposed change. (Jones, 2003; McMillan 2004).

*Theme 3: The MOE did not consider the principles of rationality while deciding on the change.*

The rationality of change decision controls its effectiveness and lead to reduce the level of tension between followers. For that reason, if the leaders of change aim to accomplish the rationality, they should have a clear notion about the purpose, reasons, goals, and impact of change. The leaders also need to recognize all available options and assess the required time and any other resources. (Robbins, 2004). However, many indications confirmed that The MOE did not consider the principles of rationality while deciding to change. I will try to spotlight on all these indications through the following line.

While the current governmental message in Jordan invites all public sector organizations to reduce the expense, the Jordanian MOE came up with the decision of operating the electronic networking project System which can become a real financial burden. I believe excluding the Jordanian Teachers' Syndicate from being a part of budget planning process caused the dissatisfaction of teachers, because many schools suffer from lack of financial resources. For example, some schools need to improve the necessary infrastructure such as drinking water reservoirs, toilets, classroom environment or the shaded areas to enhance the learning of the students.

In addition, the MOE cannot achieve the equality or equity between teachers because it is not possible to operate the fingerprint Attendance System at all schools because some of these schools still using rented buildings. Therefore, teachers of permanent buildings schools felt that it is unfair to adhere to the decision of The MOE while their colleagues who work at rented school are excluded. However, equity and equality are essential leadership ethics which enable the leaders to lead their followers effectively (Beckner, 2004).

Furthermore, the Jordanian Teachers' Syndicate perceived the decision of using the fingerprint Attendance System as an irrational one, because the MOE previously knows that teachers face a group of personal, social and professional obstacles that need to be solved before operating this technology effectively (Tashtoush et al., 2022). For example, the fingerprint Attendance System is not designed to enable the teachers who assigned to do any external mission to use the machines that are existing at other schools which means they should go back to their schools to neither punch in or out. Also, this system is not permitting the teachers who pursuing their higher education or who face any emergency to leave the school. Henry et al., (2017) confirmed that the majority of difficulties of using the Biometric Attendance System related to technical or personal causes.

*Theme 4: The MOE did not consider The TMA before using this new technology.*

As the decision of using the fingerprint Attendance System related to promoting a new technology within the Jordanian public schools, the MOE decision makers should realize that such decision required particular attention. In my opinion, the MOE could benefit from considering the technology acceptance model TAM as the most reliable model for the acceptance of user (Ghazizadeh et al., 2012). The acceptance user model indicates to Perceptions of the user about the technology usefulness and ease of use as the essential elements that impact the level of user acceptance when applying any new technology (Davis, 1989; Wardat et al., 2022).

I think the absence of the pilot study about the teachers' level of acceptance of this technology prevents the decision makers from having a clear picture about the expected reactions regarding the using of the fingerprint Attendance System. Thus, the opponents' teachers provided ample space to resist the idea. El-Abed et al., (2010) concluded that organizations should alert to the satisfaction of users when using any new biometric attendance systems.

According to me as educational leadership scholar and instructor, it is not wise to start any new idea without having a pilot period which can provide substantial feedback and an opportunity for amendments before adopting the final decision. Also, I think that the educational leader needs to consider a trustable framework to succeed in his mission of change. I do advocate the Framework for Leadership that presented by Fullan (2001) which consists of five components: first, moral purpose through working toward positive difference for all involved parties. Secondly, understanding all circumstances of change. Thirdly, building and developing the relationships between diverse individuals and groups. Fourthly, sharing knowledge. Fifthly, coherence making. According to Fullan (2001), each of these components is independent, but all of them work interdependently to promote the successful change.

## **RECOMMENDATION**

- a) This section will answer the second question of the current paper about the recommended resolutions to overcome The Jordanian teachers' resistance to the use of the fingerprint Attendance System from the perspective of the educational leadership. The recommended resolutions will be based on the presented theoretical underpinning and models, and it can be satisfactory and helpful for both the decision makers and teachers.
- b) The first step that should be taken by The MOE is to hold temporarily the decision of the fingerprint Attendance System at least for three months. The hold will enable the MOE to gain some time for reorganization and considering all necessary preparations to avoid any escalation from the teachers that can be led to a strike and negatively impact the continuity of the students learning. During the period of the three months, the MOE should attain the following:
- c) The MOE should communicate with the representatives from the Jordanian Teachers' Syndicate to reduce the current tension and regain the trust of the Jordanian Teachers' Syndicate.
- d) The MOE should provide a clear and persuasive explanation for the representatives of the Jordanian Teachers' Syndicate about the purpose of the use of the fingerprint Attendance System and how that can benefit the educational process and facilitate teachers' attendance tracking.

- e) The MOE should assign all schools principals or any other teachers who can be nominated by the school principal as coordinators, and deliver the required training for those coordinators to enable them to tackle and report any issue related to the usage of this system. This step can improve the collaboration and co-optation between the MOE and the Jordanian Teachers' Syndicate.
- f) The MOE should deliver the required training for all users about how they can use this system through the coordinators or through using the electronic methods such as videos or the electronic manuals.
- g) The MOE should conduct a pilot operating period for the fingerprint Attendance System and collect the feedback from all user and IT department about the needed amendments.
- h) The MOE should solve all technical issues that related to the software of this system to provide more Facilitation and Support to teachers and help them to tackle their difficulties while using this technology.
- i) To tackle the personal and professional difficulties when using the fingerprint Attendance System, I suggested that the software of this system should be amended to allow each teacher to get 5 hours as leave permission every month. These hours cannot be carried out to the next month and teacher can use them only for emergency cases such as family issue or traffic jam.
- j) The MOE should give a chance for all teachers from different regions to present their personal or professional difficulties when using this system.
- k) The MOE can connect the Attendance System report with the annual appraisal and the salary increments or any other types of incentives.
- l) The MOE should consider the principles of rationality in every step while deciding to change.
- m) The MOE should consider the level of TAM before using this new technology.
- n) The coercion can be used only when all other strategies failed to overcome the resistance and when the priority of work required the implementation of an immediate change.

## CONCLUSION

As a conclusion, this paper identified four themes during the discussion about the reasons behind teachers' resistance to use of the fingerprint attendance system, these themes are: The Jordanian MOE did not follow the required strategies and procedures to implement the intended change successfully, and to avoid or overcome the resistance of teachers, The ambiguity about the reasons behind intended change and the reasons behind teacher's resistance, The MOE did not consider the principles of rationality while making the decision of change and The MOE did not consider The TMA before using this of new technology. Furthermore, this paper succeeded to present some recommended resolutions to overcome from teachers' resistance which based on the presented theoretical underpinning and models, and it can be satisfactory and helpful for both the decision makers and teachers alike. Finally, the writer of this paper advocates the idea that understanding the culture and the context by the educational leader is an essential aspect to overcome teacher's resistance when implementing any change.

## REFERENCES

- Abdallah, M., & Hussein, R. (2018). Teachers' perceptions of the use of the Biometric Attendance System at Jordanian Schools.
- Alrai. (2018). BY Alrai-FEB 20, 2018 <http://www.alrai.com>
- Beckner, W. (2004). Ethics for educational leaders. Pearson College Division.
- Clavereau, M. (2012). Absence: Time to tackle the root causes. Retrieved 9th December.
- Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, pp. 319–340.
- El-Abed, M., Giot, R., Hemery, B., & Rosenberger, C. (2010, October). A study of users' acceptance and satisfaction of biometric systems. In Security Technology (ICCST), 2010 IEEE International Carnahan Conference on (pp. 170–178).



- Fullan, M. (2001). *Leading in a Culture of Change*. San Francisco, CA: Jossey-Bass.
- Fullan, M.G., & Miles, M.B. (1992). Getting reform right: What works and what doesn't. *Phi Delta Kappan*, 73(10), 745–752.
- Ghazizadeh, M., Lee, J.D., & Boyle, L.N. (2012). Extending the Technology Acceptance Model to assess automation. *Cognition, Technology & Work*, 14(1), 39–49.
- Gningue, S.M., Peach, R., Jarrah, A.M., & Wardat, Y. (2022). The Relationship between Teacher Leadership and School Climate: Findings from a Teacher-Leadership Project. *Educ. Sci.*, 12, 749. <https://doi.org/10.3390/educsci12110749>
- Hamad, S., Tairab, H., Wardat, Y., Rabbani, L., AlArabi, K., Yousif, M., . . . Stoica, G. (2022) Understanding Science Teachers' Implementations of Integrated STEM: Teacher Perceptions and Practice. *Sustainability*, 14, 3594. <https://doi.org/10.3390/su14063594>
- Harper, J. (2011). America Identified: Biometric Technology and Society. *The Cato Journal*, 31(3), 672–675.
- Henry, E.B., Echa, E.A., & Alfred, M.A. (2017). The importance and challenges of biometric machine in school supervision. A case study of Access High School, Calabar. *Equatorial Journal of Education and Curriculum Studies*, 2(2), 34–39.
- Jarrah, A.M., Khasawneh, O.M., & Wardat, Y. (2020). Implementing pragmatism and John Dewey's educational philosophy in Emirati elementary schools: Case of mathematics and science teachers. *International Journal of Education Economics and Development*, 11(1), 58. <https://doi.org/10.1504/ijeed.2020.104287>
- Jones, G.R. (2003). *Organizational theory, design, and change*. Englewood cliffs, NJ: Prentice Hall.
- Jordan Times. (2017). By JT – OCT 30, 2017 <http://www.jordantimes.com>.
- Kadry, S., & Smaili, M. (2013). Wireless attendance management system based on iris recognition. *Scientific Research and Essays*, 5(12), 1428–1435.
- Kirmani, M.M. (2017). Impact of Biometric Attendance System on Secondary and Higher Secondary Educational Institutions Across J&K.
- Lunenburg, F., & Irby, B. (2005). *The principal ship: Vision to Action*. Cengage Learning.
- McMillan, E. (2004). *Complexity, organizations and change*. Routledge.
- Oloyede, M.O., Adedoyin, A.O., & Adewole, K.S. (2013). Fingerprint biometric authentication for enhancing staff attendance system.
- Rebore, R.W. (2010). *Human resources administration in education: A management approaches* (9th Ed.). Boston: Allyn& Bacon.
- Robbins, S.P. (2004a). *Management* (5th ed.). Englewood cliffs, NJ: Prentice Hall.
- Tashtoush, M.A., Wardat, Y., Aloufi, F., & Taani, O. (2022). The effect of a training program based on TIMSS to developing the levels of habits of mind and mathematical reasoning skills among pre-service mathematics teachers. *Eurasia Journal of Mathematics, Science and Technology Education*, 18(11), em2182. <https://doi.org/10.29333/ejmste/12557>
- Wardat, Y., Belbase, S., Tairab, H., Takriti, R.A., Efstratopoulou, M., & Dodeen, H. (2022). The influence of school factors on students' mathematics achievements in trends in international mathematics and science study (TIMSS) in Abu Dhabi Emirate schools. *Education Science*, 12, 424. <https://doi.org/10.3390/educsci12070424>