Using quick response code (QR) to access the educational material at the Saudi's iEN (National education portal website)

استخدام ترميز الاستجابة السريعة للوصول للمادة التعليمية بموقع عين (بوابة التعليم الوطنية السعودية)

Written by:
Mohammed Hussain Alharbi[116]
https://orcid.org/0000-0003-4968-2594
Yaser Mohammad Al Sawy[117]
https://orcid.org/0000-0002-3150-9497

Abstract

The study aimed to identify the use of Quick Response Code (QR) to access the educational for the "iEN" website, the national learning portal in Saudi Arabia. The research team applied the analytical survey method of the study using the primary tool (the questionnaire) to a sample of 911 students of both genders. The study found extensive and active use of secondary and middle school students in the Northern Border region in Saudi Arabia. The study came up with the following main recommendations: The need to periodically measure the quality of the iEN's website's electronic courses to identify and enhance their strengths, with the need to update the quality standards of electronic content provided through the E-learning "iEN" platform. It is also essential to gradually apply Quick Response Code in public education in Saudi Arabia, with the gradual dispensation of the traditional system in the educational process. There is a need to expand the dissemination of the culture of using Quick Response Code among all segments of society, including students and faculty, and directing them to benefit from the advantages of e-learning that respects quality standards.

Keywords: Quick Response Code, educational websites, "iEN" website, Mobile education, Mobile learning devices.

المستخلص:

هدفت الدراسة إلى التعرف على استخدام ترميز الاستجابة السريعة نحو الوصول للمادة التعليمية لطلاب التعليم المتوسط والثانوي لموقع "عين" بوابة التعلم الوطنية بالمملكة العربية السعودية، حيث طبق الفريق البحثي المنهج المسحي التحليلي للدراسة مستعينين بالأداة الرئيسة (الاستبانة) على عينة مكونة من 911 طالبا من النوعين، وقد توصلت الدراسة إلى أن هناك استخداما واسعا ونشطا من طلاب المرحلتين الثانوية والمتوسطة بمنطقة الحدود الشمالية بالمملكة العربية السعودية لترميز الاستجابة السريعة للدخول إلى موقع عين (بوابة التعليم الوطنية السعودية)، يشمل ذلك الأجهزة الخاصة بالطلاب أو المملوكة للآخرين أو استخدام أنواعا متعددة من الأجهزة النقالة التعليمية، كما توصلت الدراسة للتوصيات الرئيسة التالية: ضرورة الاهتمام بقياس جودة المقررات الإلكترونية المتوافرة على موقع عين دوريا من أجل تحديد نقاط القوة وتعزيزها، مع ضرورة تحديث معايير جودة المحتوى الإلكتروني المقدم عبر منصة التعليم الإلكتروني "عين"، إضافة إلى أهمية التدرج في تطبيق ترميز الاستجابة السريعة في التعليم العام في المملكة العربية السعودية، مع الاستغناء المتدرج عن النظام التقليدي في العملية التعليمية، والعمل على التوسع بنشر ثقافة استخدام ترميز الاستجابة السريعة بين جميع فئات المجتمع من طلاب وهيئة تدريسية، وتوجيههم نحو الاستفادة من مميزات التعليم الإلكتروني الذي يُراعي معايير الجودة، والعمل على التخطيط المستقبلي لملاحقة الصعوبات التي تُعيق استخدام ترميز الاستجابة السريعة في العملية التعليمية.

الكلمات المفتاحية: ترميز الاستجابة السريعة؛ المواقع التعليمية الإلكترونية؛ موقع "عين" بوابة التعليم الوطني؛ تكنولوجيا التعليم؛ التعليم النقال؛ أجهزة التعليم النقالة.

---

[116] Assistant professor- Deanship of Preparatory Year and Supporting Studies - Department of Self-Development Skills Northern Border University - Saudi Arabia.
[117] Associate Professor of Library and Information Science – The Applied College – General Curriculum Dept.- Northern Border University - Saudi Arabia.

Introduction

QR code technology has become one of the main axes in the educational process; the curricula are renewed with technology and facilitated upon correct activation. The term QR code is a registered trademark of Denso Wave, a subsidiary of Toyota. (Al Omari & Aal Mousad, 2020).

As young students are experienced technology users, Code technology in education is an interacting tool between students and technology by creating QR code in books and linking it to references, additional resources (Dabke et al, 2021). Accordingly, QR code technology has been expanded in the educational process with an increased focus on enriching traditional teaching and learning processes by including open educational resources (OER). (Yip et al, 2016).

It also provides additional references to explain grammar and allows students to exercise additional activities. Furthermore (Mogali et al, 2019), it allows unlimited access to YouTube channels, through which the student can develop particular skills or increase information and knowledge. Moreover, it helps to attach educational aids such as written texts, images, videos, or educational games in QR code and provide them to students as continuous enrichment materials, (Talan, 2020). In addition, students' handout sheets, which contains comprehensive summaries of their lessons, can be uploaded in QR code to save printing effort and time.

Added to that, QR code helps students to do homework. For example, students often face difficulties that require additional explanation to bypass them or other resources that cannot be included in the assignment such as educational videos (Al Dosaki & Al Mousawi, 2020), which can be converted into QR Code that allow access to those resources once the learners scan them. (Abd Alrahman, 2014).

In addition, QR code could be employed to remind students of exam dates while activating the immediate connection to the school's Wi-Fi network, with the possibility of employing QR code in the flipped classroom (Adkins, 2013), especially for teachers who use the flipped class method. They can benefit from the capabilities provided by the QR code technology (Abdul Rabu et al, 2019), or an educational video to prepare for the lesson to be discussed in the classroom, which enhances mobile learning methods.

Mobile learning is teaching and learning using laptops, tablets, or smartphones. Moreover, individuals can manipulate their learning using mobile devices, considering their places, times, needs, and differences (Talan, 2020). Given that young people are technology users, mobile technology supports teaching and learning through mobile learning, distance learning, and e-learning due to the increasing use of technology in all fields. Indeed (Ucak, 2019). Researchers on mobile learning relay reinforce their research with learning theories: behavioral learning, constructivist learning, situational learning, cooperative learning, and lifelong learning.

Mobile learning can be used in traditional learning and e-learning. Students can access subject contents and curricula as they contact their teachers and schools using the Internet because mobile learning provides a similar environment to their classroom (Al Oraini & Ghanna, 2017). Learners are the center of the learning process and can communicate with other learners and coaches and interact with the curriculum. Psychologically, young learners are prepared for mobile learning because they have sufficient knowledge, skill, and experience (Ali et al, 2017).

This prompted the Ministry of Education in Saudi Arabia to launch the National Education Portal (iEN) at the beginning of the 2015-2016 academic year. Textbooks were printed with lessons supported by a QR code.

Therefore, mobile learning has many advantages, including that it does not cost much, is easy for daily use in individual and social learning, (Durak et al, 2016), the learning process is affected when mobile devices suffer software and hardware failures, causing learners to lose information or be unable to continue with educational content due to difficulties in Internet infrastructure or mobile device problems such as the battery, keyboard (Ahmed & Zaneldin, 2019) and screen. To fix practical mobile problems, learners may need to pay a high cost. In fact (Abeywardena, 2017), learners need to pay monthly or annual internet renewal costs.

Objectives of the study

The study aimed to identify the impact of using QR code to access the "iEN" website, which is an integrated portal for national education in the Kingdom of Saudi Arabia, through the following:

- Introducing QR code and its use in the educational process, especially for middle and secondary education students.
- Providing a set of standards that will achieve the quality of e-learning for students in the middle and secondary education stages.
- Presenting a set of recommendations to the educational community to make the most of e-learning through the use of QR code.
- Identify the many obstacles preventing students from making the most of QR code in e-learning and provide suggestions and solutions.
- Spreading the culture of using QR code to achieve the quality of e-learning in public education in the Kingdom of Saudi Arabia

The importance of the study

The importance of the study stems from the topic's rarity and originality, which has not been addressed in many studies. Furthermore, the use of QR code is one of the modern possibilities that can be used in the educational process, and which the student can use it to quickly access the educational content of their courses and educational support sites and applications. Therefore, the impact of studying this topic has increased, especially in light of the current technological development in the educational process in the Kingdom of Saudi Arabia in light of the Kingdom's vision 2030.

Literature review

(Mogali et al, 2019) studied mobile learning platforms in medical museums using QR Code for museum specimens at Lee Kung Chin College of Medicine, Singapore, where QR Code was generated to be linked to PDF documents with annotations, pathology. Questionnaire responses were obtained from students to verify the effectiveness of QR as an educational tool. Most students agreed or strongly agreed that it was easy to access information about samples by using QR code 96%. The majority of students (78%) agreed that QR Code are helpful for their learning. In comparison, 75% of students felt that QR Code motivates them to visit the Anatomy Resource Center.

In this context, (Al Dosaki & Al Mousawi, 2020) aimed to identify the effect of the Round Robin strategy supported by QR code technology on the achievement of fifth-grade students in biology subject. The research sample was selected from the fifth scientific-grade students in the Dohuk governorate in Iraq, and it amounted to (41) students. The random selection took place in section (B), consisting of (21) students to represent the experimental group, and section (A), consisting of (20) female students to represent the control group, and a tool was designed for the achievement test.

(Al Omari & Aal Mousad, 2020) sought to identify how Arabic teachers use the response code The Quick Response Code in teaching the Arabic subject "My Beautiful Language" and identify the obstacles they face in using this technology. The questionnaire data contained two main axes: the extent to which Arabic teachers use the QR code to teach "My beautiful language" textbook and the obstacles to using the QR code in teaching "My beautiful language" by Arabic teachers. The study results showed positive attitudes toward the use of QR Code.

In this context, the study (Al Oraini & Ghanna, 2017) aimed to identify the effectiveness of using QR Code technology on enriching the academic achievement of abstract concepts in the computer and information technology course for middle school students in Riyadh. The study sample consisted of (44) female students of the second intermediate grade in Riyadh in the First Semester of 2016-2017, which consisted of (22) female students of the experimental group who learned using QR Code technology and (22) female students of the control group who learned using the prevailing method.

In this respect, the (Talan, 2020) meta-analysis aimed to identify the impact of mobile learning on learning performance, which included 104 studies on mobile learning published between 2009 and 2019 with 7568 participants. This study measured two variables: the dependent variable, there were significant differences in the effects of mobile learning according to subject/course and language instruction.

The theoretical framework of the research

QR code

QR code is a two-dimensional code first designed by Denso, a subsidiary of Toyota in Japan, to facilitate the tracking of cars during the manufacturing cycle (El Gabbass, 2015). It then was spread in all commercial and industrial fields due to the advantages provided by QR Code and the volume of data that it can store (Grande & Pontrello, 2016). The QR code consists of black units arranged in a specific shape on a white square-shaped background.

In this context, the QR code can be employed in all fields, whether in the automotive industry or the commercial tracking of goods, transport tickets (Cetner, 2015), and the definition of product prices. Companies also use it extensively as a practical and quick way to access their websites through the mobile tag feature (Mohammad, 2022).

Added to that, version 40 of the QR code can store 7089 numbers or 4296 between numbers and letters, which practically means the ability to contain relatively large data in a small area of no more than a few square centimeters. It is a feature that saves paper and ink, which makes QR Code technology-friendly. On the other hand, QR code technology provides instant access to links without retyping them on mobile browsers.

QR code in education

QR code can be used in many fields in education, where it can be used to teach how to pronounce difficult words in foreign languages. For this purpose, an audio file can be created showing the correct way to pronounce the word and uploaded it to the web.

QR code can also be used to enable absent students to catch up on the sessions that they were unable to attend. The (Ucak, 2019).

A pre-prepared study program can also be programmed by faculty members and uploaded through specialized educational websites so that students have adequate scientific information about each of those elements by simply scanning the QR code (Thorne, 2016).

While QR Code can be employed in completing homework, students often encounter difficulties that require additional explanation or other resources that cannot be included in homework. For example, educational videos can be converted into QR codes that allow access to those resources once the learners scan them (Dabke et al, 2021).

In another framework, QR code can also be employed in classroom activities that target self-learning, where a QR code containing the correct answer can be integrated next to each question to enable the learner to verify the correctness of his response (Traser et al, 2015).

As well as, it allows quick access to educational websites, especially if they are blocked from appearing when searching for available networks or if their encryption is complex. Furthermore

(Al Omari & Aal Mousad, 2020), the access information can be transferred to a QR code that enables instant connection to the network by simply scanning it with the mobile phone's camera (Yip et al, 2016).

In flipped class method, teachers can also take advantage of the capabilities provided by the QR code technology by providing students with a QR code that carries a link to listen to an educational conversation on the subject of expression (Grande & Pontrello, 2016).

Methodology

The research Problem

Researchers have a sense of the problem of this research through the following points:

- The need to study the impact of using QR code among public education students to determine the extent of the development of the educational process.
- Measuring the impact of the contribution of QR code in increasing academic achievement and upgrading educational capabilities through rapid access to educational courses.
- Determining the strengths and weaknesses of QR code application in e-learning for middle and secondary school students.

The problem of the study is evident in studying the effect of using QR code in improving the educational process and quick access to electronic educational resources for students of intermediate and secondary education in the Kingdom of Saudi Arabia.

Research questions

The study problem can be formulated by answering the following main question:

- What is the impact of QR code on educational benefit and improving the quality of education outcomes for middle and secondary education students in Saudi Arabia?

The main question has many sub-questions are branched out from the study, which it was keen to answer within the scope of questions through follow-up axes, according to the following:

- Is there a relationship between the academic stage and using QR Code in accessing academic material on the iEN platform?
- Is there a relationship between mobile device ownership and the use of QR Code to access the academic material on the iEN platform?
- Is there a relationship between the type of mobile device used and the use of QR Code in accessing academic material on the iEN platform?
- Is there a relationship between the type of mobile device to read the QR code or its need to install a particular QR code reading program and the use of QR code to access the educational material on the iEN platform?
- Is there a relationship between the availability of technologies and devices needed to use QR Code in the textbook and the use of QR Code in accessing educational material on the iEN platform?
- Is there a relationship between the academic stage and the type of mobile device used to access the educational material on the iEN platform?
- Is there a relationship between teachers urging students to use Code to enter the IEN educational platform and the use of Code to access the QR code material on the iEN platform?
- Is there a relationship between the availability of techniques and mobile devices needed and the frequency of use of QR code while studying at home?
- Is there a relationship between the speed of opening the educational site without faltering and the frequency of using QR code while studying at home?
- Is there a relationship between access to the required educational material directly and the frequency of using QR code while studying at home?
- Is there a relationship between students' frequent use of QR Code at home and their technical skill?

The research procedures

The researchers followed the following procedures:

- Determining the theoretical framework of the research by reviewing the literature, research, and previous educational studies related to its subject.
- Building a questionnaire to measure the impact of QR code on the quality of education for middle and secondary education students in the Northern Border Region in Saudi Arabia.
- Prereviewing the questionnaire in its initial form by experts and specialized arbitrators.Preparing the questionnaire in its final form, in light of the suggestions and amendments of experts and arbitrators.
- Answring the questionnaire by the research sample.
- Statistical treatment of data, reaching and interpreting results, and making recommendations and proposals.

Research Approach

The study used the analytical survey method; The main data collection tool (the questionnaire) was also used to measure the impact of using QR Code to achieve e-learning and improve students' academic achievement through the (iEN) portal.

Research limitations

The study was implemented during the First Semester of 2021/2022, The study was applied to a large sample of middle and secondary education students in the Northern Border Region of Saudi Arabia.

The research sample

The study sample consisted of (911) male and female students in the Northern Border Region representing the intermediate and secondary education stages.

Research Terminology

QR code

A QR code is a machine-readable, graphic visual code that contains information about the item to which it is attached (Al Dosaki & Al Mousawi, 2020). Anything else, the pattern on the QR Code can be alphanumeric, numeric, or binary for more efficient data storage (Dabke et al, 2021).

E-learning websites

An educational website is a web page created over the Internet, affiliated with a government or private entity (Talan, 2020), and specialized in providing educational services and providing links specialized in upgrading educational content and services for faculty members and students (Babiker, 2016).

iEN portal

It is a safe and free portal that simulates the general education curricula in Saudi Arabia that supports digital empowerment in education and the improvement of teaching and learning processes. (iEN Portal, 2021).

iEN Toolkit

It is an electronic application for the iEN Portal to be downloaded to smartphones, containing course textbooks and digital learning materials for all stages of public education in the Kingdom of Saudi Arabia (Ien Portal, 2021).

Mobile learning

It is teaching and learning method using laptops, tablets, and smartphones (Talan, 2020).

Mobile learning devices:

Mobile learning devices: laptops, tablets, and smartphones (Dabke et al, 2021).

Results and Discussion

All Tables have been manifested by the authors and under they authorship

First Axis: Student data (study sample)

A: The gender

Table 1.
The gender distribution

Gender	Frequency	Percentage	Description
Male	229	%25	low post
Female	682	%75	high post
Total	911	%100	

Authorship: Own

It is clear that the high participation rate of females is due to the quick response from the female school administrations in general.

B. The Educational level

Table 2.
The educational level

Educational level	Female	Male	Total	Percentage	Description
Seconday	581	197	778	%85.4	High
Middle	109	24	133	%14.6	Low
Total	690	221	911	100%	

Authorship: Own

The high rate of participation for the secondary education level is due to the high rate of technology use by secondary education students, which is affected by age and experience in dealing with electronic devices.

C.   Academic level for the academic year

Table 3.
The academic level for the academic year

Educational level	Frequency	Percentage	Description
Weak	1	0%	
Acceptable	8	1%	
Good	2 6	3%	
Very well	116	13%	
Excellent	760	83%	the largest percentage
Total	911	100%	

Authorship: Own

It is viewed that there is a high tendency of outstanding students to frequent use of QR code in their learning.

D. The school type

Table 4.
The school type distribution

School type	Frequency	Percentage	Description
Public	799	%88	The largest percentage of public education
Private	112	%12	Low participation rate for private education
Total	911	%100	

Authorship: Own

It is clear that public schools' students respond to the questionnaire more than private schools due to the significantly higher distribution of public schools than private schools in the Northern Border Region.

The second axis: the use of devices and their availability

1. **I use the QR code in the textbook to access the educational material.**

Table 5.
The using of QR code in the textbook

	Frequency	Percentage	Description
Use QR code	727	about 80%	The larges percentage use QR code to accesseducational material
Do not use QR code	184	about 20%	A small percentage do not use QR Code to accesseducational material
Total	911	%100	

Authorship: Own

Significantly, most students use QR Code in while learning at home.

2. **To access the educational material, I use the QR code found in the textbook using**

Table 6.
The using of QR code in the educational material

Devices	Frequency	Percentage	Description
My own device	582	64%	The largest percentage of those who use QR Code access educational material using their device
Father/mother'sdevice	92	10%	
Brother/Sister'sDevice	25	3%	
Someone else's device	28	3%	
	727	%100	

Authorship: Own

The high percentage of usage across personal devices is noticeably higher than other types of ownership.

3. **The type of device used**

Table 7.
The type of device used

Device type	Frequency	Percentage	Description
Smartphone	574	%63	The majority of students who use QR Code use a smartphone to access educational materials
Computer	205	%23	
Tablet (iPad) or other	42	%5	
Total users	821		

Authorship: Own

According to the elements of the multiple selections of the devices used, the previous table shows a remarkable rise in the use of smartphones to a higher degree than the rest of the devices. This is because smartphones support QR code scanning technology more than other devices.

4. **I have the necessary techniques and devices to use QR Code in the textbook (such as the Internet, a telephone):**

Table 8.
The techniques and device to use QR Code in the textbook

Responses analysis										Mean	Description
Always		Often		Sometimes		Rarely		Never		4.14	High
Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage		
489	54%	192	21%	132	14%	62	7%	36	4%		

Authorship: Own

The majority of students have the necessary technologies from the Internet, as well as the availability of the devices required to complete the entry process through the use of QR code, where the positive percentage (always - often - sometimes) reached 89%, while the negative percentage (never - rarely) reached 11 %.

5. **The device I use needs to install a particular codec reader to use this technology**

Table 9.
Install a particular codec reader to use this technology

Yes		No		Mean	Description
Frequency	Percentage	Frequency	Percentage	3	High
456	50%	455	50%		

Authorship: Own

The previous table shows equal percentage of students' use of built-in codec-reading devices with students who use devices that need to install special software that enables them to read codes in the textbook.

6. **My level of experience and skill to use devices suitable for Code, such as smartphones - iPad - smart tablets.**

Table 10.
Experience and skill to use devices suitable for Code

Responses analysis										Mean	Description
Excellent		Very good		Good		Fair		Poor		4.22	Very high
Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	Percentage		
483	3%	253	28%	104	11%	38	4%	33	44%		

Authorship: Own

As it is clear from the previous table, a high percentage of students (92%) have sufficient skills to use Code to access educational material.

7. I use the "iEN Tooklit" application of the "iEN" website, the national education portal

Table 11.
iEN Tooklit application of the "iEN" website

Yes		No		Mean	Description
Frequency	Percentage	Frequency	Percentage	2.92	High
483	48%	473	52%		

Authorship: Own

The previous table also shows that a high percentage of students (52%) do not use the "iEN Tooklit" of the "iEN" website, the national education portal.

The third axis: the experience of using QR Code in the educational process

1. I know about the use of QR Code in the textbook:

Table 12.
The using of QR Code in the textbook

Items	Frequency	Percentage	Mean	Description
By myself	421	46%	2.35	High
By family (parents and brothers….)	102	11%		
By school teachers	388	43%		

Authorship: Own

2. School teachers encourage me to use the QR code in the textbook:

Table 13.
The School teachers encourage me the QR code in the textbook

Yes		No		Mean	Description
Frequency	Percentage	Frequency	Percentage	3.29	High
521	57%	390	43%		

Authorship: Own

The previous table shows that a high percentage of students (43%) reported that there is no role for teachers, either by introducing them to the method of using QR code in the textbook or urging them to use it.

3. My use of QR code while studying at home is frequent:

Table 14.

The using of QR code while studying at home is frequent

Items	Frequency	Percentage	Mean	Description
Daily	109	12%	2.71	High
Weekly	278	31%		
Monthly	96	11%		
By semester	92	10%		
Outside the house	152	17%		
Total usage	727	100%		

Authorship: Own

4. **By using QR Code in textbook, the educational Portal "iEN" opens quickly (without faltering or slowing down).**

Table 15.

The using of QR code for the quickly opening

Responses analysis										Mean	Description
Always		Often		Sometimes		Rarely		Never		3.41	High
Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	Percentage		
209	23%	307	34%	182	20%	72	8%	141	15%		

Authorship: Own

It is clear from the previous table that there is a none tiny percentage of students (43%) who reported that the opening of the educational website "iEN" was stuck or slow when using QR code, while (57%) of them said that they quickly accessed it without stumbling.

5. **The site opened by the QR code "iEN the national education portal" is clear and easy to navigate between its activities**

Table 16.

The using of QR code for the easy and clear opening

Responses analysis										Mean	Description
Always		Often		Sometimes		Rarely		Never		3.41	High
Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	Percentage		
290	32%	280	31%	141	15%	65	7%	135	15%		

Authorship: Own

Also, not a tiny percentage of students (37%) reported that it was not easy to move between iEN's activities, compared to (63%) of them who stated that the portal is clear and easy to move between its activities.

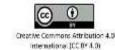6. **Using QR code, I access the required educational material directly**

Table 17.
The using of QR code for the directly access

Responses analysis										Mean	Description
Always		Often		Sometimes		Rarely		Never		3.58	High
Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	Percentage		
364	40%	216	24%	148	16%	47	5%	136	15%		

Authorship: Own

The previous table showed that 64% of the students reported that QR code communicates the required educational material directly, while (36%) of them reported the opposite.

7. **The school subjects in which I use QR code the most are (more than one subject can be specified):**

Table 18.
The using of QR code for the different subjects

Items	Frequency	Percentage	Description
Mathematics	386	42%	The highest percentage
Arabic	238	26%	
Religious studies	228	25%	
Science (chemistry-physics-biology)	187	21%	
Computer science	187	21%	
English	120	13%	
Family and arts education	64	7%	
Social studies (geography and history)	59	6%	
Management skills	55	6%	

Authorship: Own

The previous table also shows that a high percentage of students (42%) use QR code in mathematics, then Arabic (26%), science (25%), and computers (21%) in close percentages.

8. **I use QR code while studying at home with a purpose (more than one option can be selected):**

Table 19.
The using of QR code for the different options

Items	Frequency	Percentage	Description
Comprehension	396	%43	The highest percentage
Doing school activities and homework	305	%33	
Mock exams	239	%26	
simplifyingmatters	199	%22	
Listening and memoriz ation	175	%19	

Authorship: Own

9. **I enjoy learning (performing home activities and studying) using QR code technology.**

Table 20.

The using of QR code for the performing home activities and studying

Responses analysis										Mean	Description
Always		Often		Sometimes		Rarely		Never		3.23	Medium
Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage		
203	22%	234	26%	220	24%	78	9%	176	19%		

Authorship: Own

Table 21.

The using of QR code for the school activities

Items (10-11-12-13)	Responses analysis										Mean	Description
	Strongly agree		Agree		Neutral		Disagree		Strongly disagree			
	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage	Frequency	percentage		
Using the QR code technique found in the textbook while studying at home is beneficial.	211	23%	446	49%	150	16%	46	5%	58	6%	3.77	High
Learning on " iEN " website using QR Code is better than reading and doing homework through the textbook only.	199	22%	365	40%	210	23%	66	7%	71	8%	3.61	High
The educational material on the site which is opened by the QR code in the textbook is what I need to learn at home	198	22%	405	44%	202	22%	50	5%	56	6%	3.70	High
By using QR code and watching iEN my , desire for home learning and .homework is more	206	23%	392	43%	190	21%	50	5%	73	8%	3.67	High

Authorship: Own

The previous table also shows that (72%) of the students believe that learning and performing school activities at home through the iEN platform using QR code is useful. Indeed, (62%) of them say that it is better than learning with the textbook only. (66%) of them believe that the material that the QR code delivers on the iEN platform is what they need to learn at home and that it increases their desire for home learning and doing homework more than using the textbook alone.

Analytical discussion of the trends of relationships between variables and measuring stability

Question: Is there a relationship between the academic stage and QR code in accessing educational material on the iEN platform?
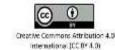
Cases * stage Cross tabulation

Table 22.

*The Cases * stage Cross tabulation Count*

		Stage				Total
		1.00	2.00	3.00	4.00	
Cases	1.00	7	6	20	96	129
	2.00	2	8	52	416	478
	33.00	10	3	35	256	304
Total		19	17	107	768	911

Chi-Square Tests

Table 23.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.890[a]	6	.000
Likelihood Ratio	25.180	6	.000
Linear-by-Linear Association	3.019	1	.082
N of Valid Cases	911		

Authorship: Own

It is viewed that the calculated value is 25.89 greater than the tabular value of 12.59, so the answer to this question is yes.

Symmetric Measures

Table 24.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.058	.041	1.739	.082[c]
Ordinal by Ordinal	Spearman Correlation	.049	.037	1.484	.138[c]
N of Valid Cases		911			

Authorship: Own

Question: Is there a relationship between the academic stage and the type of device used to access the educational material on the iEN platform?

Case Processing Summary

Table 25.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Devices * stages	1054	100.0%	0	0.0%	1054	100.0%

Chi-Square Tests

Table 26.
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.059[a]	9	.000
Likelihood Ratio	52.932	9	.000
Linear-by-Linear Association	7.671	1	.006
N of Valid Cases	1054		

The calculated value is 41.059, greater than the tabulated value of 16.919, so the answer is yes.

There is a relationship between the school stage and the mobile devices used to access the educational material. It is clear that the "secondary" school stage is the largest percentage. This can be attributed to the fact that students at this age have their own smartphone devices, which can easily access the educational material on the iEN platform.

Symmetric Measures

Table 27.
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.085	.028	2.778	.006[c]
Ordinal by Ordinal	Spearman Correlation	.137	.029	4.476	.000[c]
N of Valid Cases		1054			

Authorship: Own

Question: Is there a relationship between school teachers urging students to use Code to access the iEN educational platform?

Case Processing Summary

Table 28.
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
YESNO * type	911	100.0%	0	0.0%	911	100.0%

Chi-Square Tests

Table 29.
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.054[a]	1	.817		
Continuity Correction[b]	.016	1	.900		
Likelihood Ratio	.054	1	.817		
Fisher's Exact Test				.833	.452
Linear-by-Linear Association	.053	1	.817		
N of Valid Cases	911				

Authorship: Own

Symmetric Measures

Table 30.
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.008	.033	.231	.817[c]
Ordinal by Ordinal	Spearman Correlation	.008	.033	.231	.817[c]
N of Valid Cases		911			

Authorship: Own

Question: Is there a relationship between the school stage and the availability of technologies and devices needed to use Code in the textbook?

Case Processing Summary

Table 31.
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
TechAvability * stages	911	100.0%	0	0.0%	911	100.0%

Authorship: Own

Chi-Square Tests

Table 32.
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.224[a]	12	.010
Likelihood Ratio	25.485	12	.013
Linear-by-Linear Association	3.449	1	.063
N of Valid Cases	911		

Authorship: Own

The calculated value is 26.224, which is greater than the tabular value of 21.026, so the answer to this question is yes.

There is a relationship between the school stage and the availability of the techniques and devices necessary to use QR code in the textbook to access the scientific material. It is clear that the "secondary" school stage is the largest percentage. This can be attributed to the fact that students in this age stage can provide modern technologies, adjust the preparation of devices and download programs for reading QR Code, and also for secondary school students need extra help to understand their lessons compared to middle school.

Symmetric Measures

Table 33.
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.062	.032	-1.860	.063[c]
Ordinal by Ordinal	Spearman Correlation	-.043	.034	-1.306	.192[c]
N of Valid Cases		911			

Authorship: Own

Question: Is there a relationship between students' frequent use of QR code while studying at home and their technical skill?

Table 34.
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Skills * FRe	577	100.0%	0	0.0%	577	100.0%

Authorship: Own

Chi-Square Tests

Table 35.
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.405[a]	12	.001
Likelihood Ratio	30.662	12	.002
Linear-by-Linear Association	6.677	1	.010
N of Valid Cases	577		

Authorship: Own

The calculated value is 34.405, which is higher than the tabular value of 21.26, so the answer to this question is yes.

There is a relationship between students' use of QR Code while studying at home frequently (daily - weekly - monthly - semester) and how they possess technical skills.

Case Processing Summary

Where it is clear that students use QR Code weekly to access the scientific material on the iEN platform more than any other time range (daily - monthly - semester), and this is because teaching these materials is not daily on that platform. Still, it can be weekly, especially in high school.

Symmetric Measures

Table 36.
Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.108	.046	-2.597	.010[c]
Ordinal by Ordinal	Spearman Correlation	-.098	.044	-2.351	.019[c]
N of Valid Cases		577			

Authorship: Own

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Conclusions

The Ministry of Education in Saudi Arabia succeeds increasing the use of the QR code technology by secondary school students, which are technology skilled, to reach the "iEN" website in their learning. However, the ministry should put more effort to increase middle school students using it. It may encourage teachers to spread the culture of using QR code technology among public school. Indeed, most of students use their own smartphone devices to scan the QR code, however most of middle school students do

not own a smartphone due to their age or other circumstances. Furthermore, the students are equipped with the required technologies as well as enough skills to benefit from the QR code technology.

iEN website needs to be updated and resolve technical problems that make it hard to be navigated or slow down opening its learning materials. Also, QR code on students' textbooks should direct them to the learning materials, which drew young students' attention and add value to the textbook contents. The majority of students believe that iEN platform is useful, better than learning with textbook only, and it increases their desire in their learning and doing homework at home.

Recommendations

- The necessity of periodically measuring the quality of electronic courses available on the iEN portal is necessary to identify and strengthen strengths and discover weaknesses and address them permanently.
- The necessity of updating the quality standards of e-content provided through the e-learning "iEN" platform.
- The necessity of gradual application of QR Code in public education in the Kingdom of Saudi Arabia and dispensing with the traditional system in education for the educational process.
- The necessity of spreading the culture of using QR Code among all segments of society, including students and faculty, and directing them towards benefiting from the advantages of e-learning that respects quality standards.
- The necessity of future planning to pursue the difficulties that impede the use of QR code in the educational process.

Bibliographic references

Abd Alrahman, M. (2014). New Technique to Embed Encrypted QR Code in Colored Image by Using First and Third LSB. (Master Degree). Middle East University, Information Technology College, Jordan, 73 p. https://meu.edu.jo/libraryTheses/5874af903c7ce_1.pdf

Abdul Rabu, S., Hussin, H., & Bervell, B. (Jan 2019). QR Code Utilization in a Large Classroom: Higher Education Students' Initial Perceptions. Education and Information Technologies, 24(1), 359-384. DOI: 10.1007/s10639-018-9779-2

Abeywardena, I. (2017). Print2Screen Mobile App: Embedding Multimedia in Printed ODL Course Materials Using QR Code. Journal of Learning for Development, 4(3), 366-374.

Adkins, M., Wajciechowski, M., & Scantling, E. (2013). The Mystery Behind the Code: Differentiated Instruction with Quick Response Codes in Secondary Physical Education. Strategies: A Journal for Physical and Sport Educators, 26(6), 17-22. https://doi.org/10.1080/08924562.2013.839432

Ahmed, W., & Zaneldin, E. (2019). Blending QR Code with Video Learning in the Pedagogical Process for the College Foundation Level. Interactive Technology and Smart Education, 17(1), 67-85. https://doi.org/10.1108/ITSE-08-2019-0043

Al Dosaki, H., & Al Mousawi, S. (2020). The Effect of Round Robin Strategy Supported by QR Code Technology in the Achievement of Scientific Fifth Grade Students in Biology. Journal of Arts, Literature, Humanities and Sociology, Emirates College of Educational Sciences, (56), 268–282. Doi: https://doi.org/10.33193/JALHSS.56.2020.175

Al Omari, N., & Aal Mousad, A. (2020). The Reality of using Arabic language teachers in Riyadh city of the QR Code technology in teaching beautiful language. Specialized international educational journal, 9(3), 33-43. Doi: https://doi.org/10.36752/1764-009-003-003

Al Oraini, N., & Ghanna, A. (2017). The effectiveness of using QR Code technology to enrich the academic achievement of abstract concepts in the computer and information technology course for middle school students in Riyadh. Educational and social studies, 23(1), 957–1004.

Ali, N., Santos, I., & Areepattamannil, S. (Jan 2017). Pre-Service Teachers' Perception of Quick Response (QR) Code Integration in Classroom Activities. Turkish Online Journal of Educational Technology - TOJET, 16(1), 93-100

Babiker, N. (2016). The Modified QR Factorization and its Applications. (Master Degree). Um Dorman Islamic university, High research college, Sudan, 197 p. (in Arabic)

Cetner, M. (2015). Using QR Code in Classrooms. Mathematics Teacher, 109(2), 148-151.
DOI: https://doi.org/10.5951/mathteacher.109.2.0148

Dabke, R., Harrell, M., Melaku, S., Ray, L., & Turner, H. (Oct 2021). QR Code Labels and

Audio Commentaries for Commonly Used Chemistry Laboratory Apparatus: An Assisted Learning Experience for Visually Impaired Students. Journal of Chemical Education, 98(10), 3395-3399. https://doi.org/10.1021/acs.jchemed.1c00058

Durak, G., Ozkeskin, E., & Ataizi, M. (April 2016). QR Code in Education and Communication. Turkish Online Journal of Distance Education, 17(2), 42-58.

El Gabbass, N. (2015). Educational Potentials of QR Code for English Teachers (Structure and Applications). Educational and social researches Journal, Helwan University, Faculty of Education, 21(4), 19-45.

Grande, M., & Pontrello, C. (2016). Teacher Candidates Implementing Universal Design for Learning: Enhancing Picture Books with QR Code. Journal on School Educational Technology, 12(2), 11-23.

Ien Portal. (2021). Ein Ethraia. Retrived from: https://www.ien.edu.sa/Home/Dashbord

Mogali, S., Vallabhajosyula,R., Ng, Chee H., Lim, D., Ang, E., & Abrahams, P. (2019). Scan and Learn: Quick Response Code Enabled Museum for Mobile Learning of Anatomy and Pathology. Anatomical Sciences Education, 12(6), 664-672. DOI: https://doi.org/10.1002/ase.1848

Mohammad, F. (2022). Using Strategies "QR code & Robin Round": Children's Clothing Course. Journal of Research in the Fields of Specific Education, Minya University, (40), 423-454. DOI: 10.21608/jedu.2021.94962.1459

Talan, T. (2020). The Effect of Mobile Learning on Learning Performance: A Meta-Analysis Study. Educational Sciences: Theory & Practice, 20(1), 79–103. https://doi-org.ezproxy.indstate.edu/10.12738/jestp.2020.1.006

Thorne, T. (September 2016). Augmenting Classroom Practices with QR Code. TESOL Journal, 7(3), 746-754. https://doi.org/10.1002/tesj.257

Traser, C. Hoffman, L., Seifert, M., & Wilson, A. (2015). Investigating the Use of Quick Response Codes in the Gross Anatomy Laboratory. Anatomical Sciences Education, 8(5), 421-428. https://doi.org/10.1002/ase.1499

Ucak, E. (2019). Teaching Materials Developed Using QR Code Technology in Science Classes. International Journal of Progressive Education, 15(4), 215-228. Doi: 10.29329/ijpe.2019.203.16

Yip, T., Melling, L., & Shaw, K. (Sep 2016). Evaluation of an Online Instructional Database Accessed by QR Code to Support Biochemistry Practical Laboratory Classes. Journal of Chemical Education, 93(9), 1556-1560. https://doi.org/10.1021/acs.jchemed.6b00184