



INVESTIGATING FACTORS THAT INFLUENCE THE USE OF YOUTUBE IN TEACHING BIOLOGY IN HIGH SCHOOLS IN SAUDI ARABIA BASED ON THE TECHNOLOGY ACCEPTANCE MODEL

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Abstract

With more than one billion users, YouTube is ranked the third most visited website worldwide (Hootsuite, 2018). Students of the current generation have their unique way of life, which in turn influences the way they learn and develop. It is important for teachers to utilize such technology in the teaching process to meet the digital natives' needs. The purpose of this study is to investigate the factors that influence the adoption of YouTube in teaching biology in high schools in Saudi Arabia. The technology acceptance model (TAM), was used as the study's theoretical framework. Data were collected from 109 biology teachers. The results of path analysis showed that behavioral intention significantly influences the actual use of YouTube, teachers' attitudes toward the use of YouTube in teaching influence their behavioral intention, and perceived usefulness and perceived ease of use both influence teachers' attitudes. Moreover, the correlational analysis results showed no significant relationship between teachers' years of experience and their actual use of YouTube in teaching. However, there was a significant relationship between teachers' efficiency in using classroom technology and their actual use of YouTube in teaching. These results emphasize the importance of educating teachers about the



benefits of using YouTube for the current generation of students, and the importance of training courses for teachers in emerging technologies.

Keywords: Educational Technology, Science Education, YouTube in Teaching, TAM

Highlights

- TAM predicted 26% of the variance in actual use of YouTube in teaching.
- TAM predicted 45% of the variance in behavioral intention.
- Teachers' attitudes toward the use of YouTube in teaching were influenced by perceived usefulness and perceived ease of use.
- Teachers' efficiency in using classroom technology impacts their use of YouTube in teaching.

1. Introduction

The characteristics of any generation differ from those of previous generations. Thus, each generation has a unique way to learn. Clearly, the current generation, the *digital native*, learns differently from other generations. The role of educators is to facilitate learning for them. Statistics shows that digital natives are highly connected to interactive technology and the media. Typically, students bring to school what they love and experience. Therefore, it can be quite a challenge for teachers to break this connection while students are in class. In fact, teachers do not need to break this connection but to take advantage of it and utilize it to tailor learning to their students. Students prefer an interactive instructional process that is more compatible with the ways that they typically encounter information.

In general, the integration of these new technologies that students use and play with daily outside the classroom into the instructional process makes education more attractive and suitable for the students. Moreover, these technologies have features that can be utilized to enhance students' outcomes as well. Technology provides the opportunity to do things differently while still meeting desired learning outcomes. Instead of spending a great deal of time and physically going to the school libraries to search for helpful resources that can be used to enrich the instructional process, the usability of YouTube saves teachers a lot of time and effort in finding helpful resources online.

YouTube is a website where users can create videos and share them with others. These videos may have multiples uses, such as entertainment, news, and discussions, as well as, learning, etc. YouTube was created in 2005 and has grown worldwide. Many of these technologies are



referred to as “social media” in that they allow for both the creation and exchange of user generated content. According to a report by Hootsuite (2018), 80% of youth in Saudi Arabia visit YouTube at least one time every day, and 44% of them spend three hours on YouTube daily. The use of YouTube in the instructional process provides benefits for students and teachers. These benefits include: grabbing students’ attention, focusing students’ concentration, observing experience that is difficult to observe in reality, generating interest in the subject, improving attitudes toward content, building a connection with students, fostering creativity, increasing collaboration, motivating students, making learning fun, decreasing anxiety on scary topics, increasing understanding, and facilitating deeper learning (Berk, 2009). Research also shows that students’ outcomes are improved when videos are integrated into instruction (Alwehaibi, 2015; Jones & Cuthrell, 2011).

There is a wide range of ways that YouTube can be used to enhance the process of learning. It can be used as a part of the instruction inside the classroom to show an experience, illustrate a new concept, summarize the important points, model a performance etc. Moreover, YouTube can be used as part of their homework, where students are assigned to watch a video on YouTube that is related to the subject and share what they see. Teachers also can record their lectures and upload them to YouTube, so that those who miss the lecture or would like to review the lecture can have access to it. YouTube can be used to strengthen cooperative learning, as well. For example, teachers can require students to have their own channel on YouTube and create and exchange powerful videos that help them to master the subject.

1.1. Significance of the Study

Throughout history, teachers have usually played an important role in the adoption of any new type of technology in education (Bates, Bates, & Sangra, 2011). Thus, to make this adoption successful, factors that influence teachers’ intention to use YouTube in teaching need to be investigated. Even though the enormous benefits of using YouTube in teaching are very clear worldwide, in Saudi Arabia “this technology has not been exploited much for educational purposes” as Alwehaibi (2015) claimed (p. 123).

The significance of this study is driven by two points. First, no published research has investigated the adoption of YouTube into high schools in Saudi Arabia by teachers of biology or other science subjects. Thus, this study tried to fill this gap in the literature. Second, the findings of this study will provide more insight about the current use of YouTube in teaching, specifically the factors that influence the use of YouTube by high school teachers. This in turn will help those in authority to work on these factors to expand the use of YouTube as part of the teaching process.



2. Literature review

2.1. Prior research

Several studies have investigated the influence, the benefits, and the integration of YouTube in teaching worldwide (Alwehaibi, 2015; Bates et al., 2011; Berk, 2009; Desmet, 2009; Duffy, 2008; Everson, Gundlach, & Miller, 2013; Fujioka, 2017; Gallant, 2014; Gurvitch & Lund, 2014; Jones & Cuthrell, 2011; Niess & Walker, 2009; Park, 2009). Alwehaibi (2015) used a quasi-experimental design to study the influence of integrating YouTube into teaching English as a foreign language. She found that students who were exposed to videos as part of their instruction showed positive gains in the post-test. YouTube can also be used to improve students' outcomes in mathematics, as Niess and Walker (2009) found in their study. They used old videos that contained mathematical errors, and students were asked to point out errors in these videos clips, which in turn improved their ability to avoid such mistakes. Park (2009) notes that some teachers recorded students while performing science experiments and used them as examples for other students.

2.2. Technology Acceptance Model (TAM)

Several theoretical frameworks have been proposed to explore factors that influence the adoption of technologies. The technology acceptance model (TAM) is among the most popular theoretical frameworks in technology acceptance studies in the field of education. TAM was proposed by Davis, (1985). TAM was built to predict users' intention toward using a particular technology based on the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975). TAM has been empirically found to successfully predict 52% of the variance in behavioral intention (Taylor & Todd, 1995). A number of studies used TAM to investigate the adoptions of a variety of technologies in the last decades in the learning process (Alharbi & Drew, 2014; Iqbal & Bhatti, 2015; Ngai, Poon, & Chan, 2007; Teo, Wong, & Chai, 2008)

TAM was designed to predict and explain factors that influence an individual's acceptance of new technologies. It suggests that actual technology acceptance is influenced by individual's behavioral intention. Behavioral intention here refers to the strength of an individual's willingness to use this technology in the future. Behavioral intention to use a particular technology is influenced by attitudes related to that technology. Attitudes here refers to an



individual's feeling and thoughts that he or she shapes about this technology. Attitudes toward technology are determined based on perceived usefulness and perceived ease of use. Perceived usefulness refers to an individual's beliefs about the consequences of using this technology and whether it is beneficial or not. Perceived ease of use refers to the individual's beliefs about the difficulty of using this technology. Based on related studies, two demographic factors were added to TAM by the researcher to gain more information about the current use of YouTube in teaching, which are years of experience and efficiency in using classroom technology.

2.3. Study purpose, questions and hypotheses

The purpose of this study is to investigate the adoption of YouTube in teaching biology in high schools in Saudi Arabia. As demonstrated in Fig 1 (p. 6), the study uses TAM as the theoretical framework. The following research questions were investigated:

- 1) What is the relationship between teachers' actual use of YouTube in teaching biology and years of experience?
- 2) What is the relationship between teachers' actual use of YouTube in teaching biology and efficiency in using classroom technology?
- 3) What is the relationship between teachers' behavioral intention and their actual use of YouTube in teaching biology?
- 4) What is the relationship between teachers' attitudes toward using YouTube in teaching biology and their behavioral intention to use it?
- 5) What is the relationship between teachers' perceived usefulness and their attitudes toward using YouTube in teaching biology?
- 6) What is the relationship between teachers' perceived ease of use and their attitudes toward using YouTube in teaching biology?
 - H1: Behavioral intention to use YouTube in teaching biology will have a significant positive relationship with the actual use.



- H2: Attitudes toward using YouTube in teaching biology will have a significant positive relationship with behavioral intention.
- H3: Perceived usefulness will have a significant positive relationship with attitudes toward using YouTube in teaching biology.
- H4: Perceived ease of use will have a significant positive relationship with attitudes toward using YouTube in teaching biology.

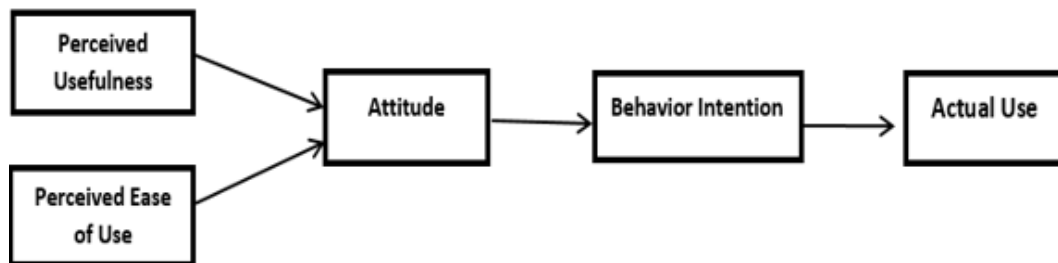


Fig 1. TAM model for teachers' acceptance of using YouTube in teaching.

3. Method

3.1. Participants

Data were collected from 109 biology teachers across the Taif educational district in Saudi Arabia. The sampling technique used in the present study was convenience sampling. The details of the participants are shown in Table 1. The teachers were sent a link to a survey hosted on SurveyMonkey.com, using social media networks such as *WhatsApp* and *Twitter*. Two additional reminders were sent, three weeks apart.



3.2. Instrument and data collection

A survey was administered to the participants who volunteered for this study. The survey instrument consisted of 18 items to assess constructs of the proposed model. These items were adapted from previous studies and were refined to make them specifically relevant to this study (Davis, 1985; Taylor & Todd, 1995). To ensure content validity, the instrument used in this study was reviewed by two experts other than the author. Then, the survey was translated into Arabic because the teachers in Taif city are native Arabic speakers. The author used the back-translation method to make sure that both versions matched each other. This method suggests that the survey should be translated by bilingual experts back and forth from the source language, English, to the targeted language, Arabic. The five-point Likert scale, ranging from 1 – strongly disagree to 5 – strongly agree, was used in this study. The survey was distributed online through SurveyMonkey.com, a survey-hosting website, and was conducted during Fall 2017.

3.3. Analysis

Statistical analyses were conducted using Statistical Packages for the Social Sciences (SPSS) version 23. Descriptive statistics were used to illustrate the demographic characteristics of the sample. Correlational analysis was used to answer research questions one and two. Path analysis was the main analytic technique implemented to determine the causal effects among variables in the TAM model.

4. Results and Discussion

4.1. Demographics and descriptive statistics

One hundred and nine completed responses were received. As illustrated in Table 1, the sample consisted of 31 (28.4%) male participants, and 71 (71.6%) female participants. The majority of participants hold educational degrees, 98 (89.9%). Of the participants, 69 (63.3%) had less than 11 years of experience, while 9 (8.3%) had over 20 years of experience.

**Table 1**

Demographic characteristics of the study sample

| Variable | Sample (N = 109) |
|---------------------|------------------|
| Gender | |
| Male | 31 (28.4%) |
| Female | 78 (71.6%) |
| Degree | |
| Educational | 98 (89.9%) |
| Non-educational | 11 (10.1%) |
| Years of Experience | |
| Less than 11 years | 69 (63.3%) |
| > 10 < 21 | 31 (28.4%) |
| More than 20 years | 9 (8.3%) |

Error! Reference source not found. reports the means and standard deviation for each of the independent variables and dependent variables included in the TAM model. The mean of the Actual Use scale was found to be 4.29 ($SD = .895$, on a scale of 1-5). This indicates that the participants' mean ratings on items regarding their actual use of YouTube in teaching biology fell between *Agree* (4) and *Strongly Agree* (5). Participants' responses also reflect a similar mean in behavioral intention, attitude, perceived usefulness, and perceived ease of use.

Table 2

Descriptive Statistics for the Independent and Dependent Variables

| Variable | M | SD | Data Type |
|-----------------------|------|------|-----------|
| Actual Use | 4.29 | .895 | Ordinal |
| Behavioral Intention | 4.46 | .530 | Ordinal |
| Attitude | 4.25 | .471 | Ordinal |
| Perceived Usefulness | 4.52 | .441 | Ordinal |
| Perceived Ease of Use | 4.22 | .479 | Ordinal |

Note. N = 109. Scores were determined using a 5-point Likert-type scale (1-Strongly Disagree, 2- Disagree,



3- Neutral, 4-Agree, 5- Strongly Agree)

4.2. Reliability

Instrument reliability is an important characteristic that is used to ensure that the instrument used for measuring variables gives the same results every time. Different approaches are available to judge instrument reliability. Internal consistency was used in this study to measure the instrument reliability. Cronbach's alpha is used to estimate the internal consistency by measuring the correlations between different items on the same construct, which normally vary on a scale from 0 to 1, with 0.70 or higher considered acceptable (Nunnally & Bernstein, 1978). The overall Cronbach's alpha for the entire instrument was 0.90 and, the Cronbach's alpha coefficients for the four independent variables, behavioral intention, attitude, perceived usefulness, and perceived ease of use, were higher than 0.70 as presented in Table 3, which indicates that the instrument can be considered reliable and consistent.

Table 3

Cronbach's alpha Score for the TAM constructs

| Theoretical Framework | Constructs | Cronbach's alpha |
|-----------------------|-----------------------|------------------|
| TAM | Behavioral Intention | 0.85 |
| | Attitude | 0.74 |
| | Perceived Usefulness | 0.81 |
| | Perceived Ease of Use | 0.82 |

4.3. Correlation analysis

Correlation analysis was used to answer research question one and research question two. Research question one concerns the relationship between actual use of YouTube in teaching and teachers' experience in teaching, and research question two was about the relationship between the actual use of YouTube in teaching and the teachers' efficiency in classroom technology. A Pearson correlation coefficient was used to explain the relative strength and direction of the relationship between the variables. The values of the Pearson correlation measure range from 1 to -1, the number indicating the strength of the relationship and the sign indicating the direction of the relationship.



As presented in Table 4 (p. 10), in regard to research question # 1, no significant correlation was found between actual use of YouTube in teaching and years of experience ($r(109) = 0.903$, $p > .01$, two-tailed). In regard to research question #2, which asks about the relationship between the actual use of YouTube in teaching and teachers' efficiency in classroom technology, the Pearson correlation shows a significant positive relationship ($r(109) = 0.346$, $p < .01$, two-tailed).

Table 4

Correlation Coefficient Analysis for research question 1 and 2

| <i>Independent Variable</i> | <i>Dependent Variable</i> | <i>Pearson Correlation</i> | <i>P</i> |
|---|---------------------------|----------------------------|----------|
| Years of experience | Actual Use | -.002 | > .01 |
| Efficiency in using classroom technology. | Actual Use | .346** | < .01 |

** Correlation is significant at the 0.01 level (2-tailed)

4.4. Path analysis for TAM model

Path analysis was conducted to test the hypothesized relationships in the TAM model. As anticipated, the TAM model was able to explain much of the variance in actual use and behavioral intention to use YouTube in teaching. The TAM model explained 26.1% of the variance in actual use, 45.4% of the variance of behavioral intention, and 54.3% of the variance in attitude (Table 5, p. 10).

Table 5

Path analysis for TAM factors

| Equation | R^2 (adjusted R^2) | Beta (t-scores) |
|-----------------------------------|-------------------------|-----------------|
| Actual Use = Behavioral Intention | 0.261 (0.251) | |
| Behavioral Intention | | .511 (6.141)*** |
| Behavioral Intention = Attitude | 0.454 (0.449) | |



| | | |
|-------------------------------------|---------------|------------------|
| Attitude | | 0.674 (9.436)*** |
| Attitude = Usefulness + Ease of use | 0.543 (0.534) | |
| Usefulness | | 0.371 (4.442)*** |
| Ease of use | | 0.447 (5.355)*** |

Note. N = 168. *p < .05. **p < .01. ***p < .001

Fig 1 (p.11) contains the results of the pathways of TAM with the beta values of each path. The beta value determines the significance of the impact of each path. For research question # 3, the results of the path analysis indicated that behavioral intention had a significant effect on actual use ($\beta = .511$, $t = 6.141$). Thus, research hypothesis # 1 is supported. Regarding researcher question # 4, teachers' attitude toward the use of YouTube in teaching also had a significant effect on behavioral intention ($\beta = .674$, $t = 9.436$). Hypothesis # 2 is supported as well.

Finally, for research questions #5 and #6, both perceived usefulness and perceived ease of use had significant positive relationships with attitude ($\beta = .371$, $t = 4.442$; $\beta = .447$, $t = 5.355$). Thus, hypothesis #3 and hypothesis #4 are supported by path analysis results.

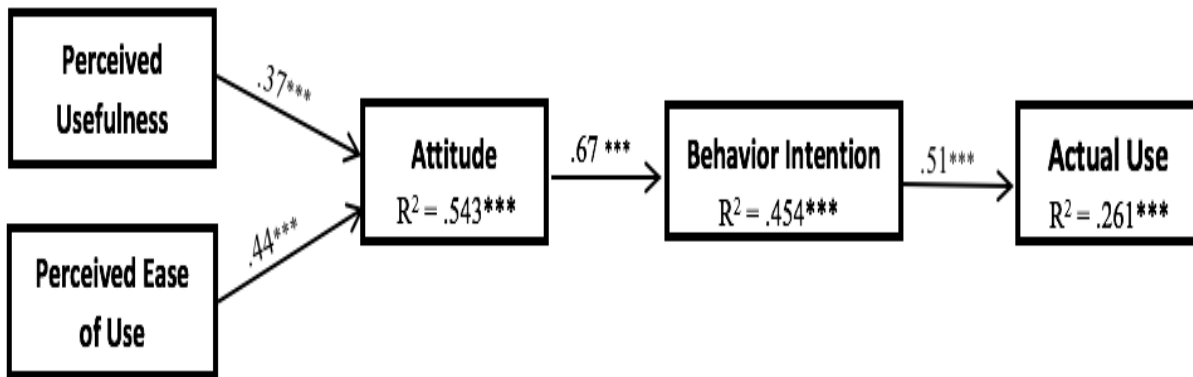


Fig 1. Path diagram of TAM model for teachers' acceptance of using YouTube in teaching.



5. Conclusion and recommendation

The use of YouTube in the teaching process has been proven by studies to enhance the learning process. It can help to grab students' attention, improve social skills, foster creativity, increase collaboration, motivate students to deep learning, etc. Besides that, the current generation of students has their special characteristics that teachers need to address in order to help them to learn. It is clear that the current generation of students are highly connected to the internet and Web 2.0 tools such YouTube. Thus, the use of these technologies in the classroom will make the learning process more attractive. Teachers are the center of the adoptions of these new technologies in education. This study tries to fill a gap in the literature by investigating the factors that influence teachers' usage of YouTube in teaching biology for high school students. TAM was used in this investigation as the theoretical framework.

The result of research question #1 indicates that teachers' years of experience does not influence their use of YouTube in teaching. This suggests that there is no difference regarding the actual use of YouTube in teaching between experienced teachers or new teachers. Moreover, the result of research question # 2 indicates that teachers' efficiency in using classroom technology impacts their use of YouTube in teaching. This implies that teachers whose efficiency in using educational technology, such as projectors, computers, smart boards etc., is low are most likely not to consider YouTube as part of their instructional process. This in turn highlights for school administrators the importance of providing training courses and resources for teachers to increase their efficiency in using classroom technology.

Regarding the TAM model, TAM successfully predicted 26% of the variance in actual use and 45% of the variance in behavioral intention. All paths in TAM were found to be significant paths. These results provide another proof that demonstrates the appropriateness of using TAM to investigate the adoption of new technologies in education. The result of research question # 3 indicates that behavioral intention was a strong predictor of actual use of YouTube in teaching. Teachers' attitudes toward the use of YouTube was a strong predictor of behavioral intention, as well. Teachers' attitudes were influenced by perceived usefulness and perceived ease of use. These results suggest that teachers' attitudes play an important role in the use of YouTube in teaching, and these attitudes can be influenced through their thoughts about the benefits and the usability of YouTube in teaching. This provides two practical suggestions for school administrators. First, they must be aware of the importance of directing teachers' attention toward the benefits and features that YouTube can provide for them and for the students. Second, as suggested earlier, they must emphasize the importance of training teachers on how to use new technology such as YouTube in teaching.



5.1.Recommendation for future research

The goal of this study was to investigate the factors that influence teachers' use of YouTube in teaching biology courses for high school students. The results of this study can serve as a foundation for future research for studying the adoption of new technologies in teaching high school courses. Here are some suggestions for future research. First, more demographic factors such as gender, age, major, type of degree, and type of school can be investigated in future research. Second, different theoretical frameworks can be implemented to get more insight into other factors such as subjective norms, self-efficacy and motivations. The Theory of Planned Behavior (TPB) and the Decomposed theory of Planned Behavior (DTPB) are examples of theoretical frameworks that contain more factors. One limitation of this study was that all of the participants were from one district in Saudi Arabia. Thus, another worthy idea for future research is to study a mixed sample from the thirteen districts in Saudi Arabia.

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