**Abstract**

Digital technology is a key and integral part of our lives. The digital age is characterized by changes that require a readjustment in many areas of the education system. Technology may serve and support the teaching, learning, and assessment process. One way of teaching technology that incorporates technology is the flipped classroom approach - a type of hybrid teaching that includes both face-to-face and distance learning (Horn & Staker, 2011). In this approach, distance learning is odelivered through recorded videos, and face-to-face learning takes place in small group activities (Bishop & Verleger, 2013). Online assessment tasks can support the flipped classroom approach, assisting both teacher and learner at various levels such as: providing immediate learner feedback (Whitelock, 2006), convenience, time-limited (Noguera et al., 2019; Henderson, 2016), place and resources, saving The lecturer's time in exam exercises, and more. Although many studies have been conducted in the field of flipped class, and others in the field of online assessments, few are the studies dealing with a field that combines these two aspects (teaching and assessment), and investigates online assessments as a tool that accompanies and supports learning in the flipped class approach. One of the few studies that has focused on this combination is Henderson (2016).

Chemistry-based approach is when chemistry application and its connection to real-world situations are at the center of chemistry teaching. In this approach, chemical concepts are taught in the "need-to-know" approach, where students require concepts to understand the real-world phenomena. The research literature has many advantages to the context-based learning approach in the sciences: it contributes to learners 'level of interest and enjoyment (Avargil et al., 2012;), enhances students' understanding of curriculum (wannagatesiri et al., 2017), raises student awareness The relevance of content to real-life and real-world (Bennett & Lubben, 2003; Parchmann et al., 2006; Stolk et al., 2016; wannagatesiri et al., 2017; King & Henderson, 2018). It is important to note that this approach is being applied and researched in higher education and upper secondary schools, but less so in middle school: "Many studies have been conducted around context-based teaching in science for high school students and above, but very little has been done in context-based learning in science for middle school students" ( King & Henderson, 2018).

**Purpose of the study and its questions**

The purpose of this study is to implement and investigate an innovative teaching process in chemistry, incorporating flipped classroom methodologies and online assessment into context-based learning in chemistry from the perspective of middle school students. In addition, the study also examines and characterizes generic activities carried out by learners on their own initiative as well as their academic achievements. These goals are achieved by (a) examining learners' attitudes and perceptions of context-based learning in the flipped class approach to chemistry, using a structured open-ended questionnaire; (B) Examining learners' level of awareness of context-based learning through an examination of generic activities (initiated by students themselves) that assist in technology and chemistry-related learning, while attempting to characterize them, and using a travel journal; (C) Examining learners 'performance and achievement in online assessment tasks by examining the correlation between learners' achievement in the online tasks used as a tool for assessment, and their achievement in a conventional written test.

**Research questions**

1. What are students' attitudes toward context-based learning in a hybrid chemistry environment? And how do they perceive it?

2. Do the students carry out generic activities (on their own initiative) that are assisted by technology and chemistry related, except for the dedicated activities (requested by the subject teacher)? And if so, how can these activities be characterized?

3. Is there a correlation between student achievement in online assessment tasks and their achievement in the conventional written test?

**Study variables**

1. Learners' attitudes towards context-based learning - This variable includes learners' attitudes as expressed in students' written feedback from the structured open-ended questionnaire.

2. Context-based activity type - Two types of context-based activities mentioned in the student logs were examined: dedicated activity, and generic activity. In addition, we characterize the generic activities: learner, content, content-learner.

3. Student performance collected through two assessment tools: scores on online assessment tasks; And conventional written test scores. For each student, an average score of four online assessment tasks done across the study unit was calculated and a conventional written test score with paper and pencil held at the end of the study unit.

**Methodology**

The study population included one grade of 32 seventh grade students in middle school. This is a private school in the Arab sector. The class has 17 boys, and 15 girls. The present study combines quantitative and qualitative methodologies. Several research tools were used in the research:

1. A structured open-ended questionnaire, which is the feedback students were asked to submit to learn about their attitudes and perceptions about context-based chemistry learning in the flipped classroom approach.

2. A travel journal - where students documented their activities. The journal sought to record any activity related to the topic of chemistry and that the student performed it using a computer or mobile phone. For each activity, students were asked to report time, place, and content of the activity, as well as its relationship with real-life or real-world from the learner's perspective.

3. Assessment Tasks (Online and Written) - The study used the students' grades and average scores in four online assessment tasks performed throughout the study unit. In addition, a conventional written test with paper and pencil was done at the end of the study unit as a concluding test. Learners' scores on online assessment tasks were compared with their traditional test scores.

The study incorporated qualitative and quantitative methodologies into the study of activity, attitudes, opinions and perceptions of learners. The analysis of generic activities in the present study is based on a “model for characterizing mobile activities in context” developed by Ezra (2017) while adapting and adapting to the present study. The settings after adaptation to the present study are as follows:

• Content - The activity content is related to a real-life or real-world context, but the learner did not follow the "non –noticing case" link. 4 such activities were found out of a total of 22 generic activities.

• Learner - The activity content is not related to real-life or real-world context, but the learner did the link, "self-relation case". One such activity was found out of a total of 22 generic activities.

• Content-Learner .The activity content is related to a real-life or real-world context, and the learner did the link. There were 17 such activities out of a total of 22 generic activities.

It should be noted that Ezra has made two separate definitions for real-life and real-world, and the categories listed above are for real-world only. However, in the present study no real-life or real-world distinction was made, and so the above categories relate to both the real world and real life. So the Ezra model has been partially implemented, and not fully adapted to the current study. It should be noted that the Ezra model was developed for "contextual learning" but also found to be appropriate for context-based learning in an online environment.

**The main research findings**

Students 'perceptions and attitudes toward context-based learning in a hybrid environment in chemistry (Question 1) - Students' attitudes and perceptions were analyzed for the three components of the flipped class method: (1) context-based learning in a hybrid environment in chemistry; (2) video learning; And (3) online assessment tasks.

From the students 'comments, learners' attitudes and perceptions of the three components of teaching were characterized. These positions were grouped into primary and secondary categories after coding the attitudes and perceptions and finding a common denominator between them (hereafter the categories and sub-categories):

A. Cognitive: Understanding; Performance and achievement; Concentration and memory.

B. Emotional: mental calm; Pleasure and interest; comfort.

C. Relevance Awareness: Ability for learners to provide real-life and real-world examples and content related to the topic being studied.

D. Flexibility: time limit (when? And how much?); Place restriction (where?); Accessibility to available resources (books, notebooks, the Internet).

E. Responsibility: Developing a learner's responsibility for his or her learning process.

F. Technology Affinity: The learner's affinity and preference for learning in methods that integrate technology.

Generic Technology-Aided Chemistry Activities (Question 2) - The findings of the study showed that a total of 106 dedicated study activities were carried out in the study unit, compared with 22 generic activities. A z test was performed to distinguish proportions between mobile phone use in dedicated activities (36 out of 105), versus mobile phone use in generic activities (16 out of 22). The test results showed a statistically significant difference \*\* Z-Score = -3.3341, P-Value <0.01 between the two types of use (mobile phone versus computer), which indicates a wider use of the mobile phone for generic activities compared to a wider use of a computer for specific activities. . As mentioned earlier, the analysis and characterization of generic activities relied on a “model for characterizing mobile activities in context” developed by Ezra (2017), while adapting and adapting to the present study. The definitions after adaptation to the present study.

Regarding the third research question, which deals with students 'achievement in online assessment tasks and their achievement in the conventional written test, it was found that students' achievement in online assessment tasks (E-Tasks) ranged from 0 - 98, with a mean of 73.9 and standard deviation of 23.1. Students' achievement in the conventional written test ranged from 10 - 95, with an average of 73.9, and a standard deviation of 18.4. A strong positive correlation was found between student achievement in the online assessment tasks (mean 73.9, SS 23.1) and their achievement in the conventional written test (mean 73.9, SS 18.4) {r = 0.630, p <0.01}.

In conclusion, the findings of the study indicated positive attitudes of learners towards context-based learning in a hybrid chemistry environment. Students preferred to use a computer for dedicated activities, and a mobile phone for generic activities. Students demonstrated high awareness of the relevance of real-life and real-world phenomena to content and study material at the end of the study unit. Achievements learned in online assessment tasks match their achievements in a conventional paper and pencil test.

**Discussion, main conclusions and new research directions**

The findings of the present study indicated positive attitudes of learners towards incorporating technology into the learning process. References to "affinity for technology", the "flexibility" that technology allows such as access to available resources, information sources, and the ability to search for information during the lesson, these findings were also found in a previous study by Manny Ican, Berger Tikochinsky, And Bashan (2015) as part of the Smart School project. Furthermore, students expressed positive attitudes toward distance learning through videos in the flipped classroom approach. These findings encourage us, as researchers and teachers alike, not to worry about incorporating technology into the teaching process for young ages. The inverse class approach has been found by learners to incorporate technology, innovate, require learner personal responsibility for his or her learning process (Sletten, 2017), enable flexibility in time and place performance (Burgman & Sams, 2012; Herreid & Schiller, 2013; Henderson, 2016;). Unlike most studies conducted in higher education, or upper secondary schools, in order to investigate students' attitudes toward distance learning through videos in the flipped classroom, the current study is applied in the middle school to relatively young students, but at the same time provides similar findings. These findings encourage us, as researchers and teachers alike, not to worry about incorporating technology into the teaching process for young ages.

Online assessment tasks have gained the most positive attitudes on the part of learners, explaining their positions by allowing online assessments to be flexible in terms of performance (when to do the task? And how much time is allowed for the learner to stay within the task?) (Henderson, 2016; Noguera et al., 2019) , Available resources (books, notebooks, the Internet), high levels of concentration, relaxation, and stress-free mental health, comfort (Nogueraet al., 2019), which makes online assessment tasks easier compared to a standard test, allowing scores higher than a point Learners' gaze. Previous research has indicated learners' positive attitudes toward online assessments, although for other reasons, such as the benefit of instant feedback on automated e-assessment online assessment tasks (DiBattisa et al., 2004; Whitelock, 2006; Bahar & Asil, 2018). Again, most research in the research literature investigates these attitudes for students in upper secondary school or higher education institutions, but the current study examines this for young middle school students. Contrary to the findings of the current study described here, the findings of other studies (Patronis et al., 2019) actually indicate students' preference for "pen and paper" in exams.

The findings from a structured open-ended questionnaire analysis indicate positive attitudes of learners toward context-based learning in a hybrid chemistry setting. It was evident that this approach received strong testimony from learners whose content was largely clear and appreciated, in their own estimation and perspective, similar to previous studies that indicated learners' positive attitudes, in understanding the scientific content in a context-based learning approach in the sciences (Bennett et al., 2007; Wannagatesiri et al., 2017), and with a high level of pleasure and interest from this approach (King, 2012; Avargil, Herscovitz, & Dori, 2012; Wannagatesiri et al., 2017). In addition, research findings show that context-based learning in chemistry does help learners see the relevance between the curriculum and phenomena that students encounter in real-life and real-world. These findings are similar to previous findings in the research literature (Bennett & Lubben, 2003; Parchmann et al., 2006; Stolk et al., 2016; Wannagatesiri et al., 2017; King & Henderson, 2018). Unlike most studies in higher education or upper secondary schools, the current study is applied in the junior high, to relatively younger students (very little research has been done on contextual learning in science for middle school students (King & Henderson, 2018), but nonetheless provides) Similar findings.

The findings of the study showed a significant difference between the types of devices students used to perform generic and dedicated activities. These findings invite new research directions, such as how young students perceive objects in terms of digital self-ability, and how can digital self-ability be raised? And, how do students perceive the electronic device in terms of possible uses?

Learners' achievement in online assignments was found (strongly correlated) to their achievement in a conventional written test. This suggests the ability of online assessment tasks to assess learners' performance and perhaps even as test preparation, though, this argument needs further testing, and may serve as a guide for further research. At the same time, it is recommended to investigate the validity and reliability of online assessments, and to assess their suitability for different populations and ages. Found in the research literature, a high correlation between the degree of student involvement (how much they do online exercises and experiences) and their achievement in the final test (Henderson, 2016), students who did not submit online assessment tasks failed the final test, and students who persisted and increased in self-assessment and online assessments. High scores in the final test. Another study by Soffer and Cohen (2019) examined student engagement characteristics in online courses and their impact on academic achievement, while trying to distinguish between online course completers and those who do not. Course topics and on-going assignments and assignments predicted completion of the course, while, in addition to these variables, course materials and reading forums also predicted success in the final exam. These testimonies support the degree of learner involvement and the use of online assignments and contribute to their success and achievement. Monitoring the activity of learners on the website accompanied by a profession can serve as a topic for further research, forecasting and predicting dropout and success.

**Research contributions**

The research described here may add to the existing body of knowledge about learners' attitudes toward the opposite classroom approach, as well as online assessments. Studies indicate that questions remain about how students experience diverse forms of online assessment (Stodberg, 2012). The study may contribute to reducing the existing gap pointed out by researchers Bahar and Asil (2018), who noted that, despite a wealth of research on attitudes toward computer-based teaching, attitudes toward online assessments require focus due to little research done in the field. Furthermore, research may help develop content and learning units that will serve teachers. In a study by Stolk and his partners (2016), researchers note that successful implementation of a pedagogical approach, which relies on context-based learning, requires professional development for teachers. Although many studies have been conducted in the field of reverse class, and others in the field of online assessments, there have been very few studies dealing with a field that combines these two aspects, investigating online assessments as a tool that supports and supports learning in the opposite class approach. One of the few studies focused on this combination is Henderson (2016). Many studies have been conducted around context-based learning in science for high school students and above, but very few studies have been conducted on context-based learning in science for middle school students (King & Henderson, 2018). The research described here may narrow the current gap in research literature on science-based learning in middle school students.

he study sheds light on a topic that was not defined in this study, and did not formulate a focused research question, and is the emotional aspect that students reported on. Students reported high levels of relaxation, peace of mind, and comfort when conducting online assessments, and high levels of stress, stress, and anxiety in traditional paper and pencil tests, limited in time, on-site, with available resources and tools. These findings contradict the findings of (2019) Patronis et al., Which indicate students' preference for "pen and paper" in exams. These statements on the part of learners reveal further added value of online assessments, and also invite new research directions.