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Examining Motivation to Learn and 21st Century Skills in a Massive Open Online Course

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Guided by the social cognitive theory, the study aims to understand motivations and 21st century skills in the context of massive open online course (MOOC) in teacher education, and to examine the relationships between participants' motivation, their 21st century skills, and their achievement level in the MOOC. The research included teacher education students (N =232), who completed a MOOC titled "Teaching-Thinking" which was delivered at Campus.gov.il platform. The study applied the mixed methods approach. The quantitative data was collected by pre- and post-questionnaires, as well as log data regarding learners' performance. The qualitative data was based on interviews. Significant differences in learners' motivation and their 21st century skills before and after the MOOC were indicated. Results also indicated a statistically significant positive relationship between achievement level and 21st century skills. This study contributes to the evaluation of the effectiveness of MOOC learning for education students based on their motivation to learn and the 21st century skills.

Keywords: MOOC, motivation, 21st century skills, socio-cognitive theory, teacher education

INTRODUCTION

In recent years, there is a growing drive among higher education institutions to develop distance education courses, in general (Barak, 2012; Masry-Herzallah, 2022) and massive open online courses (MOOCs) in specific (Aljaraideh, 2019; Barak, Watted & Haick, 2016; Kizilcec, & Schneider, 2015). MOOCs are web-based courses, designed to provide free and accessible high-quality education to the masses (Barak et al., 2016; Cormier & Siemens, 2010). MOOCs are open to all participants from all ages and countries; they do not require preliminary qualifications or prerequisite courses. Most MOOCs include short segments of video lectures arranged according to the course topics. They also include an e-book or related articles, discussion forums, and learning tasks that participants are required to submit. Because masses of participants (thousands or even tenths of thousands) take these courses, the learning tasks are either automatically graded (e.g., closed-ended quizzes) or peer-graded (e.g., open-ended essays, written assignments). This educational phenomenon is perceived as a 'disruptive

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innovation' to traditional higher education among many educationist, stakeholders, and policy makers. However, there is yet little evidence regarding the way and manner in which MOOCs promote learning among adult learners. Extant research indicated that Massive open online courses have gained great popularity among adult learners, as many professionals use them to advance their careers (Alzahrani, & Meccawy, 2021; Watted & Barak, 2018). Other studies indicated that it is frequently used by adults who are not only working, but also trying to improve their skills (Fang, Hwang, & Chang, 2019; Vezne, 2020). Especially in the context of 21st century skills that are required for successful careers in our global and dynamic world (Gamage et al. 2016; Karatas & Apraci, 2021; Puhek & Strmsek, 2019). Gamage and colleagues (2016) state that MOOC participants promoted critical thinking and communication skills while other skills such as collaborative skills and creativity and innovation pose different results. Puhek and Strmsek (2019) show in their research that MOOCs in the business and management field supplied users with leadership skills, self-direction, and technology skills, among others. They also pointed that MOOCs' supply of innovation, communication skills, and critical thinking among learners. Little is known about the of 21st century skills of those who successfully complete MOOCs, especially in academic colleges of education

Motivation is an internal state that arouses, directs, and sustains goal-oriented behaviour (Bandura, 2006). Given that MOOCs are becoming more and more popular worldwide, learners' motivation has been studied from various aspects (Barak & Watted, 2015; Kizilcec & Schneider, 2015; Sinha, 2014). Such motivations include general interest and curiosity, (Barak & Watted, 2017; Kizilcec & Schneider, 2015; Liu et al., 2015; Watted & Barak, 2018) personal challenge, career development, and extending current knowledge (Hew & Cheung, 2014; Wang & Baker, 2015). Research has mainly focused on understanding the motivation of the MOOC enrollees; however, little is known about the motivations of those who successfully complete MOOCs, especially in academic colleges of education.

This study aims to understand motivations and 21st century skills in the context of MOOCs in teacher education.

Literature Review

The literature review includes four sections. The first section describes the social cognitive theory and motivation to learn. The second section describes massive open online courses. The third section describes motivation to learn in massive open online course, and the final section presents the issue of 21st century skills.

The Social Cognitive Theory and Motivation to Learn

The social cognitive theory, which has been developed by Bandura (1986; 2001; 2006), explains learning and motivation as a reciprocal interaction between three elements: personal factors; environmental factors and behavior factors. The personal factors refer to cognition, affect, and biological events; the environmental factors refer to the social norms and physical settings; and the behavior factors such as self-regulatory practices. The social cognitive theory has roots in both educational psychology and sociology. It is

a model of behavior, maintaining that learning occurs in a social context and that much of what is learned is gained through observations. Based on the work of Bandura (2001; 2006) and followers (Glynn, et al., 2011; Schunk et al., 2008), learning is viewed as most effective when it is self-regulated; when students monitor, and control their motivation and behavior.

According to the social cognitive theory, motivation is an internal state that arouses, directs, and sustains goal-oriented behavior (Bandura, 2006). Motivation has a significant influence on the learning process. Pellegrino and Hilton (2012) argued that motivation assists learners to organize and integrate their information mentally and that this cognitive process leads to deeper learning. Other studies attempted at determining why students strive for specific targets, what monitors their learning, and what are the emotions that typify this process (Bolte, Streller, & Hofstein, 2013; Bryan et al., 2011; Glynn et al., 2011; Hofstein & Kempa, 1985).

Consequently, five motivation components were indicated: intrinsic motivation, self-determination, self-efficacy, career motivation, and grade motivation (Glynn et al., 2011). Intrinsic motivation refers to the inherent satisfaction to be engaged in an activity for its own sake. Self-determination is the ability of the students to be in control and regulate their learning. Self-efficacy indicates the students' confidence in their ability to successfully complete a learning task. Career motivation and grade motivation are both extrinsic motivations that represent the performance of a task to achieve an external reward or goal. Grade motivation, related to short-term goals, and career motivation, related to long-term goals, which more clearly target the objectives that students perceive to be important in this stage of their education (Glynn et al., 2011) Studies indicated that these components are related to each other and that they influence students' behavior and self-regulation in the learning process (Bryan et al., 2011; Glynn et al., 2011). In this study, we applied four of the five motivational components described above. We examined learners' intrinsic motivation, self-determination, self-efficacy, and career motivation. We did not use the grade motivation scale since it is not relevant in a MOOC setting, which is open and free.

Existing research links between these components and the online learning behavior. For example, intrinsic motivation has been established as a corresponding factor to both satisfaction and MOOC completion. As Barak et al., (2016) note, participants' self-efficacy and level of motivation directly affect their learning behavior. Intrinsic motivation is of the highest importance to online learning satisfaction, and the lack of motivation and self-regulation skills in remote learning may result in poor-quality work (Romero-Frias et al., 2020). Kosycheva et al., (2021) found that self-efficacy is a significant factor in predicting academic achievement by increasing motivation to achieve. The importance of academic self-efficacy indirectly influenced academic aspirations. Rabin et al., (2020) posit that self-efficacy can enhance learning and performance and lead to higher satisfaction with the achieved results, and that online learning self-efficacy has been found to be a predictor of student satisfaction in online courses. Furthermore, Romero-Frias et al., (2020) point to the existing link between intrinsic motivation and online learning involvement and satisfaction. Their research

suggests that "high intrinsic motivation participants interact more frequently with the platform contents, tend to be more actively involved in forums and are more participative, which is consistent with a motivation originating in the satisfaction experienced when learning new things".

Firat et al., (2018) also argue that learners need to have intrinsic motivation to persists in their program of study. The gap between intrinsic and extrinsic motivation in an online learning environment is also pointed out by Firat et al., (2018) as impactful to participants in programs where direct interaction between participants and instructors is limited.

A positive correlation between motivation to learn and online learning satisfaction has been established in extant literature. This motivation is linked to the intrinsic drive to learn and explore out of curiosity and personal development. As Milligan & Littlejohn (2017) suggest, key motivations to study are intrinsic in nature, related primarily to personal improvement. They also posit that career motivation plays an important role in motivation for students, as the courses complement their formal study or help broaden their skillset to increase their effectiveness at work and enable them to innovate.

Sujatha & Kavitha (2018) also point to the importance of self-determination as a factor of online learning satisfaction. In MOOC settings, lack of self-determination is said to be an important factor in retention rates among students and MOOC participants. In light of the aforesaid, this study set to understand teacher education students' motivation to learn "Teaching Thinking" in a Massive Open Online Course (MOOC).

Massive Open Online Courses (MOOCs)

A Massive Open Online Course (MOOC) is a web-based course available free to any participant from any place in the world (Cormier & Siemens, 2010; Kop & Carroll, 2011). MOOCs provide free access to high-quality learning materials, offered by elite universities without the need to meet formal entry requirements (Barak, Haick, Watted, & Bar-Segev, 2013). In the past, MOOCs were divided into two types: cMOOCs and xMOOCs. The cMOOCs highlight the principles of connectivism, which are: creation, creativity, autonomy, and social networked learning. They maintain a student-centered approach, emphasizing diversity, openness, and interactivity (Daniel, 2012; Siemens, 2005). On the other hand, the xMOOCs are more closed and structured; they present contents in a traditional way, including lecture videos, online quizzes, and large-scale examinations. The xMOOCs specify start and finish dates with a detailed schedule that indicates the learning outcomes throughout the course duration. They are mainly found in specially designed platforms such as Udacity, Coursera, and edX (Rodriguez, 2012; Masters, 2011). In the past years, differences between cMOOCs and xMOOCs have become irrelevant since new social components were integrated into MOOC platforms for improving engagement and learning. These components include online forums, blogs, and chatrooms (text-based or video-based), where learners can virtually meet their peers and participate in discussions. In this study, the integrated approach was applied in the development of the MOOC to enhance both individual and social learning.

The term MOOC was first coined in 2008 to describe a course, titled: "Connectivism and Connective Knowledge", offered online for free by the University of Manitoba (Cormier & Siemens, 2010). In 2012, new MOOC platforms were developed, utilizing advanced information and communication technologies and automated computing to support the large number of participants who sought interest in taking the open courses.

Since they were first launched, MOOCs' popularity is growing rapidly among adult learners, educational researchers, designers, and instructors. More than nineteens thousand MOOCs, ranging from engineering and computer science to history and literature are offered by more than 950 universities on various platforms such as Coursera and EdX (Class Central, 2021).

Following the world trend of delivering MOOCs, the National Digital Bureau, Ministry for Social Equality in Israel, supported the development of MOOCs in higher education in Israel. More than half a Million Israelis participated in hundreds of academic MOOCs offered by more than 20 Israeli leading institutions. The offered MOOCs has been launched on Campus platform; a free of charge national platform for digital learning in Hebrew and Arabic languages (Raviv & Weiss, 2019)

Within this initiative, Al-Qasemi Academic College of Education launched in 2019 a course entitled "Teaching Thinking" in a MOOC format, which is running on Campus platform. The MOOC is delivered as two separated courses, one in Arabic and the other in Hebrew. It is important to indicate that both courses have the same learning materials and assignments.

Motivation to Learn in a Massive Open Online Course

Understanding motivation to participate in a MOOC is gaining much interest among researchers (e.g., Barak et al., 2016; Littlejohn, et al., 2016; Watted & Barak, 2018). Research has shown that motivation is an important determinant affecting learner engagements in MOOCs (Barak, 2016; Halasek et al., 2014; Yang, 2014). Halasek and colleagues (2014) found that participants' interests and personal motivation determined whether and how they engaged with course materials. In their study, for example, many participants observed the course as educators interested in MOOCs but did not assume the role of student; others read or watched the course materials with no intention of completing the course assignments; while others completed the course assignments and selected individualized sets of enrichment materials provided by the open-source textbook. Still other participants avoided the enrichment materials and took part in the discussion forums (Halasek et al., 2014). Yang (2014) found that there was no relationship between students' intrinsic motivation - the inherent satisfaction to be engaged in activity for its own sake - and their participation in the discussion forums at the initial stage of the course. However, the relationship between intrinsic motivation and participation became stronger and significant as the course progressed over time. Similar results were reported by Barak and colleagues (2016); they found that participants who were highly involved in the discussion forums indicated high gains in motivation. Moreover, they found that motivation increased among those who completed the MOOC. These results correspond with other studies, showing that lack of

motivation may result in attrition and dropout (e.g., Hew and Cheung, 2014; Wang & Baker, 2015).

Motivation to learn in MOOCs is also linked to intrinsic motivation for participants who study for enjoyment and personal growth. Bárkányi (2021) posits that learners with intrinsic motivation are more likely to complete the course than those joiners whose motivation is extrinsic, a fact that is also reiterated by the Milligan and Littlejohn (2017) study, which posits that individuals appear to be intrinsically motivated – either through individual interest in the topic or relevance and utility value. Professional motivations also play an important role as reason to complete MOOCs. These motivations range from relevancy to job, acquiring a new skill, and professional development (Badali et al., 2022). Extant research shows that motivations to learn in online environments in general and MOOCs specifically are first and foremost intrinsic (Milligan & Littlejohn, 2017; Liu et al., 2022; Romero-Frias et al., 2020; Firat et al., 2018; Bárkányi, 2021; Yang, 2014) professional (Badali et al., 2022), and personal (Kosycheva et al., 2021; Rabin et al., 2020), including self-efficacy. These motivations are seen to be positively linked to MOOC enrollment, engagement, satisfaction, and completion. Preservice teachers were found to enroll in online courses which were mostly related to their professional field and technical development (Sezgin, 2020), which hints at the relationship between MOOC enrollment and engagement among preservice teachers and the motivations for them.

Based upon our review, the majority of the extant research on MOOCs has focused on understanding the motivation of general populations who took MOOCs. However, little is known about the specific motivations of pre-service teachers, and about the relationship between these motivations and promoting individual 21st century skills. A qualitative and a quantitative approach was applied in order to better understand the incentives of MOOC participants. Previous studies have been based mainly on quantitative methods in which participants were given a list of motivational factors to rate.

21st Century Skills

The widespread phenomena of new digital environments and mobile technologies led to the creation of new theories and models in education. Connectivism and collaborativism, theories emerged, in addition to behaviorism, cognitivism and constructivism, to address the needs and opportunities of the 21st century (Harasim, 2017). PBL (Problem, Based Learning; Project Based Learning), flipped classroom, blended learning and many other learning models have been developed as a result of the Internet invention. MOOCs, are one of these models that are widening, and need to be studied of their effectiveness from different viewpoints. This study is interested in the intersection of MOOCs and 21st century skills.

Various skills are proposed to meet the needs of the current century, which are characterized mainly by the continuous and fast changes in digital technology, knowledge, economic market, and globalization. Various educational frameworks exist nowadays to improve the skills needed for a successful life, work, and education in the

21st century (Griffin & Care,2014; P21 Partnership for 21st Century Learning, 2015; Wagner, 2015). It is possible to categorize these skills into personal (such as critical thinking and flexibility), social (such as collaboration and leadership) and digital skills (such information literacy and digital communication).

The P21 (P21 Partnership for 21st Century Learning, 2015) developed a framework that describes the knowledge, skills, and expertise that students must master to succeed in work and life. This framework categorized the 21st century skills into four categories:

- Key subjects and 21st century themes: (1) formal subjects, such as languages, math, and others; and (2) interdisciplinary subjects, such as finance, global health literacy in a higher level of awareness and understanding.
- Learning and innovation skills: this category includes skills that prepare students for a complex life, and includes critical thinking and problem solving, creativity and innovation, communication, and collaboration.
- Information, media, and technology skills: information, media, ICT, literacy; accessing, analyzing, creating, and applying.
- Life and career skills: skills needed to meet the challenges of modern life such as flexibility, cross-cultural skills, leadership, etc.

This study used the survey developed by Ravitz and Richmond (2014) to measure 21st century skills. The survey divided the skills into critical thinking, collaborative skills, creativity and innovation, self-direction skills, global and local connections, and technological skills.

Various programs, models and studies are interested in studying and developing methods to improve 21st century skills in general and in education in specific. Several studies showed that ICT integration in education can improve 21st century skills, and those can improve students' lives. Jacobson-Lundeberg (2016) showed how teaching 21st century skills modified the lives of college student and empowered them, despite the fact that those students came from a marginalized socio-economic community. Andrade (2016) showed how using ICT integrated pedagogy (flipped classroom) enhanced 21st century skills among students. Ganayem and Zidan (2018) showed how online courses based on TEC model (Technology, Education and Cultural diversity) enhanced higher order thinking, multicultural awareness, ICT skills and ICT pedagogical skills. Puhek and Strmsek (2019) point to the potential of the possibility of MOOCs to supply users with 21st century skills and transversal skills. A significant relationship is found between readiness for online learning and metacognitive awareness, self-directed learning skills, and 21st century skills competency (Karatas & Apraci, 2021).

While on the other hand merely ICT integration doesn't mean automatically enhancing 21st century skills. The study of teacher training in Israel concluded that educators and mentors are still modeling traditional technology in education through presentation and demonstration use, despite the fact that the Israeli Ministry of Education (2011) has adapted the 21st century skills to its educational system (Goldstein & Asaf, 2014; Goldstein & Tesler, 2017).

Since ICT is part of our daily life, it is critical to integrate ICT in education side by side with the use of the special opportunities of ICT to develop other 21st century skills. MOOC courses are one of the modern learning models, that is widening in the educational systems, including the Israeli educational colleges for teacher training. Hence it is important to examine the development of the 21st century skills with the context of MOOC environments.

METHOD

Research Goals, and Questions

Guided by the social cognitive theory, the goals of the study were to examine learners' gains in motivation, and 21st century skills after participating in MOOC, and to examine the relationships between participants' motivation, their 21st century skills and their grades in the MOOCs. These goals raised the following research questions:

1. What are the learners' gains after participating in "Teaching Thinking" MOOC, in regard to:
   i. Motivation?
   ii. 21st century skills?
2. What are the relationships between learners' motivation, their 21st century skills and their grades in the MOOC?

Research Participants and Setting

This study was based on a research sample of MOOC learners who completed a MOOC titled "Teaching Thinking" at a local college. Participants were recruited using debrief letters which the researchers distributed at the beginning of the academic term. The letters included a brief explanation of the study and its purposes, and participants were notified that their participation is voluntary and that they can withdraw from the research at any given point.

Two hundred thirty-two learners participated in the pre-and post MOOC survey, about 86% of whom were females and only 14% were males. Approximately 72% of the participants were under the age of 26 years old, 25% of them were between 26 and 45 years old, and the rest were over 45 years old. Approximately 73% of the participants had only finished their undergraduate degree, 19% of them had finished their postgraduate taught degree, and the rest had finished their postgraduate research degree. 14% of those participants specialized in science degrees, 8% specialized in mathematics, 43% specialized in languages, 20% specialized in child learning, and the rest specialized in education. 61% of them were students, 36% were teachers, and the rest were either amateurs, industry professionals, or scientists. Finally, 61% of the participants were not working in education, 26% of them had less than 10 years of experience working in education, 11% of them had 10-14 years of experience, while the rest had more than 14 years of experience.

This study was conducted in the settings of massive open online courses (MOOCs) on *Teaching Thinking*, in Arabic language. The MOOC presents a conceptual map which guides the students in the field of teaching thinking. According the map there are three

approaches to teaching thinking: the skills approach, the dispositions approach, and the understanding approach. Each approach suggests different answer to the key question: what is the element that generates good thinking and how should we teach it? The course was eight weeks long with estimated workload of 4-to-6 hours per week. It included eight video lectures divided into short segment 10-to-15 minutes, and three types of graded assignments: weekly quizzes, open-ended questions, and a final exam.

The course website also included, articles, an e-book, and three online forums: a. Questions about the learning materials, b. Questions about the course assignments and c. Who are you? Participation in the forums is optional and free, encouraged and supported by the course teaching team.

Methodology, Tools, and Data Analysis

The mixed method research model was employed in this study by using both quantitative and qualitative methodologies in the collection, analysis, and interpretation of data (Johnson, Onwuegbuzie & Turner, 2007). The study followed the convergent parallel design (Creswell, 2014), in which the quantitative and qualitative methodologies are prioritized equally. In this design, the quantitative and qualitative data were collected concurrently during the study, they were analyzed separately, and the results were merged during interpretation.

The study included three research tools:

a) **Close-ended Questionnaire**: The questionnaire was administered to examine learners' motivation and 21st century skills. The questionnaire was administered twice, at the beginning and the end of the MOOC. It consists of 89 items categorized into four parts:

- *Part 1*: Demographic data and basic information: It Composed of six items: Gender, age, level of education, academic field, occupation and years of experience
- *Part 2*: Motivation Questionnaire: It composed of 20 items that identified participants' motivation to learn "Teaching Thinking" MOOC. The Questionnaire was adapted from the Science Motivation Questionnaire (Glynn et al., 2011). It included four categories: intrinsic motivation, career motivation, self-determination, and self-efficacy, each composed of 5 items, on a 1 (strongly disagree) to 5 (strongly agree) Likert-type scale. The fifth category of the original questionnaire: 'grade motivation,' was not included in this study since it was conducted in the context of free and open course. The original items were modified to correspond with the contents of the "Teaching Thinking" MOOC. For example, the item: "The science I learn is relevant to my life" was changed to: "Teaching Thinking is relevant to my life". High reliability of the Motivation Questionnaire was observed in the present study, with a Cronbach's alpha of 0.97 for the overall scale. For intrinsic motivation it was 0.93, career motivation 0.89, self-determination 0.93, and self-efficacy 0.95.
- *Part 3*: 21st Century skills Questionnaire (56 item) identified the following skills, known as 21st century skills: critical thinking, collaborative skills, creativity and innovation, self-direction skills, global and local connections, and technological skills. This questionnaire was based on the survey developed by Ravitz and Richmond (2014),

"A Survey for Measuring 21st Century Teaching and Learning: West Virginia 21st Century Teaching and Learning Survey". The survey was reported to have excellent reliability, std. alpha > .90, with inter-item correlations > .58. All ranking items were using the 5-likert scale; 1=not at all to 5=very much. While ICT skills, was developed by the researchers to meet the more recent ICT skills, from basic uses (word processing software, such as Microsoft word and google docs) to a more advanced Internet sharing platform (such as google drive and 365 Microsoft), to a higher-level skill (such as programming). The reliability of the 21st Century skills Questionnaire by Cronbach's alpha was calculated in this study 0.97 For critical thinking 0.92, collaborative skills 0.93, creativity and innovation 0.92, self-direction skills 0.93, global connections 0.94, local connections 0.92, and technology use 0.96. The questionnaire was translated to Arabic and then validated by five experts in the field. Finally, a joint questionnaire was developed in an online tool and published with a direct link from the MOOC.

b) **Semi-structured interviews***:* The interviews aimed to examine participants' motivations and their 21st century skills. Sixteen participants who were willing to speak about their experiences via MOOC were interviewed. Thirteen were females and only tree were males. To recruit research participants, a message was sent to the MOOCs learners at the end of the course, inviting them to take part in the study semi-structured interviews. The interviews were conducted face to face and fully transcribed. Each interview took about 45minutes and was audiotaped and accompanied by a research diary. Example questions: How would you describe your learning experience in the "Teaching Thinking" MOOC? And Which skills have you promoted through participating in the "Teaching Thinking" MOOC?

c) **Log data**: students' grades in the different assignment in the course were collected and analyzed.

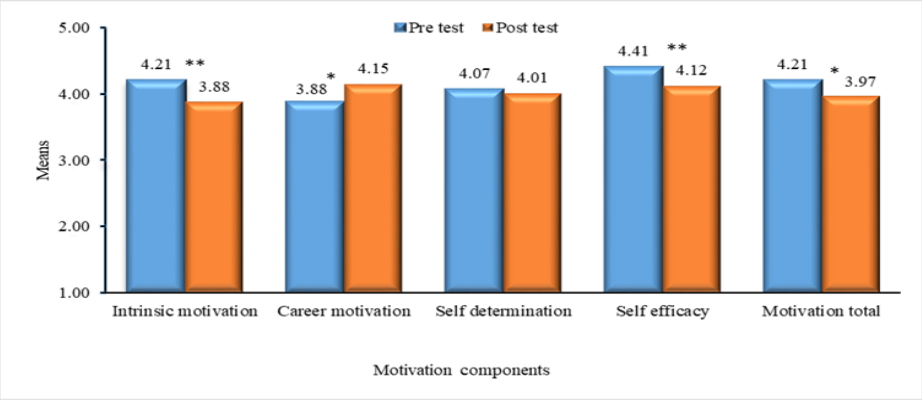
In the proposed study, the quantitative data, collected from the pre- and post-questionnaires, was statistically analyzed by IBM Statistical Program for the Social Sciences (SPSS), version 22.0 (IBM, 2013), applying parametric models. The models were tested according to the four basic assumptions: normal distribution of data, homogeneity of variance, interval data, and independence. Accordingly, the descriptive statistics and general linear model (GLM) were applied (Field, 2009; McCulloch & Searle, 2000). The parametric statistical tests included: Variance (ANOVA) tests Covariance (ANCOVA) tests, and Pearson correlation test.

The qualitative data collected via Semi-structured interviews was analyzed via a combination of deductive and inductive content analysis (Willig, 2013). This included the following steps: 1. The participants' assertions were compiled into one coherent file; 2. Three independent researchers red them rigorously and marked relevant text segments that indicated, explicitly or implicitly, participants' motivation to participate in to a MOOC or participants' 21st century skills; 3. The marked text segments were assigned to categories based on existing theories; 4. The segments that did not fall under the categories based on existing theories were assigned to new categories; 5. Associated categories were grouped. Inter-coder reliability was calculated for all the data. (Hsieh & Shannon, 2005).

RESULTS

Learners' Gains After Participating in "Teaching Thinking" MOOC

To examine learners' levels of motivation and 21st century skills after completing the MOOC – a t-test was conducted for all research variables as shown in Figure. 1 and Figure. 2.

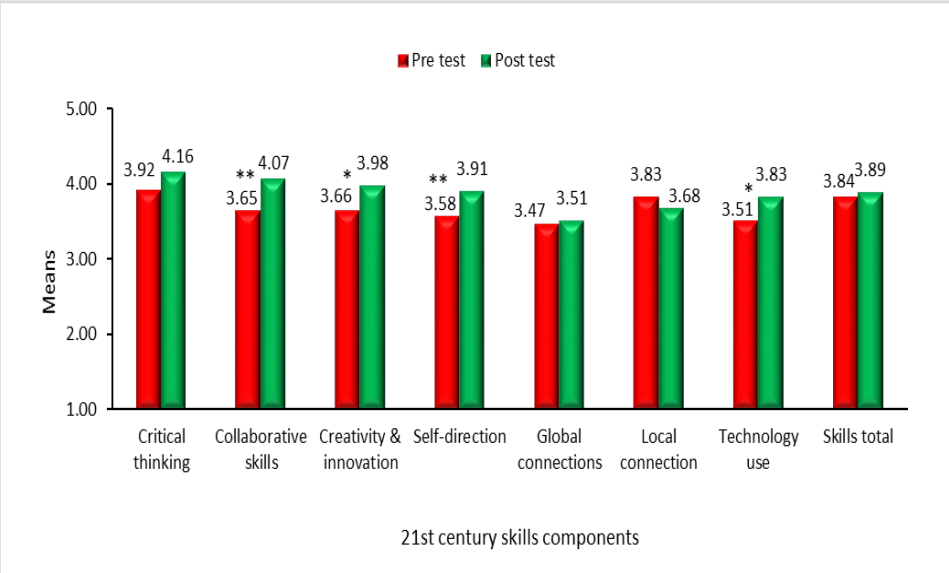


*p<0.05, **p<0.01

Figure 1

Learners' motivation gains after participating in "Teaching Thinking" MOOC (N =232)

Figure 1. shows that there are significant differences in the levels of motivation components among the participants before and after they had completed the MOOC. The participants who completed the MOOC had higher levels of intrinsic motivation before commencing the course (M = 4.21, SD = 0.78) than after completing it (M = 3.88, SD = 0.92). These differences are statistically significant ($t(231)$ = 2.73, p < 0.01). Similarly, the participants had higher levels of self-efficacy before commencing the course (M =4.41, SD = 0.68) than after completing it (M = 4.12, SD = 0.84). The statistical difference was calculated at ($t(231)$=2.78, p<0.01). However, the participants displayed higher levels of career motivation after completing the course (M = 4.15, SD = 0.94) than before commencing it (M = 3.88, SD = 0.75). The statistical difference was calculated at ($t(231)$ = 2.22, p<0.05). As for the levels of self-determination, results show that they have not changed before and after enrolling in the course.



*p<0.05, **p<0.01

Figure 2

Learners' 21st century skills gain after participating in "Teaching Thinking" MOOC (N=232)

Figure 2. shows that there are significant differences in the levels of 21st century skills among the participants before and after they had completed the MOOC. The participants who completed the MOOC displayed higher levels of collaborative skills after completing the course (M = 4.07, SD = 0.94) than before commencing it (M = 3.65, SD = 0.82). These differences are statistically significant (t(231)= 3.63, p < 0.01). Similarly, the participants displayed higher levels of creativity and innovation after completing the course (M = 3.98, SD = 0.89) than before commencing it (M = 3.66, SD = 0.80). The statistical difference was calculated at (t(231) =2.63, p <0.05). Likewise, the participants displayed higher levels of technology use after completing the course (M = 3.83, SD = 0.85) than before commencing it (M = 3.51, SD = 0.87). The statistical difference was calculated at ($t(231)$ = 2.62, p<0.05). Also, the participants displayed higher levels of critical thinking after completing the course (M =4.16, SD=0.90) than before commencing it (M =3.92, SD =0.72). The statistical difference was calculated at (t(231)=2.26, p<0.05). In addition, the participants displayed higher levels of self-direction after completing the course (M=3.91, SD=0.84) than before commencing it (M =3.58, SD =0.69). The statistical difference was calculated at (t(231) =2.73, p<0.01). As for the other skills, results show that they did not differ before and after enrolling in the course.

For deeper understanding of MOOC learners' gains after participating in "Teaching Thinking" MOOC, sixteen students were interviewed. Content analysis of learners' interview transcripts revealed 169 statements that signified the learners' gains in the

MOOC. It was observed that most of the participants (80%) had not heard about Massive Open Online Courses (MOOCs) before, and that this was their first experience with one. For example, Lama a second-year students asserted "*This was my first experience. This is the first time I learn in an online course before the pandemic, and it's the first time I hear about MOOCs and the Campus platform"*. On the other hand, few participants noted that this was their second experience. For example, Samer a second-year students asserted "*I enrolled in some MOOCs on other educational platforms, such as Edraak."*

The qualitative results revealed that in this MOOC, participants showed high *intrinsic motivation to learn* – passion for learning new information, and gain knowledge, – without caring for academic achievement, as this MOOC was obligatory for the fulfillment of their academic degree. For example, Ahmed, a third-year student asserted "*To be honest, the experience was great, interesting, and exciting. A new way of learning and a new approach that widens the thinking horizons for learners".* Other participants had *low motivation*, finishing the course with a minimal success grade for their academic degree. This was shown in the effort put by the participants and the difficulty of commitment and time management in weekly assignments: Finishing eight tasks and one home exam seriously and efficiently and relying on written essays and recorded lectures on the Campus learning platform. For example, Salma, a second-year student asserted "*The number of tasks is big, which decreased student motivation to watch recorded videos/lectures, commit to the weekly assignments, in addition to unjust peer reviews. The units and videos require sufficient time and effort."* Another student, Rima, noted that "*In the beginning I found the MOOC to be difficult. It requires weekly tasks, and I must commit to submit them on time, in addition to the time I spent on the units, which sometimes required three hours".*

After the MOOC experience, a variety of responses were noted. Some participants had trouble studying the MOOC because it was an online course. "*I felt like I lost many things because the course was online. Had it been frontal, opportunities for discussion would have been beneficial for the topics covered in the MOOC, which would in turn be more beneficial for the students. I feel like these topics would be more beneficial and entertaining in a frontal environment*." Ahlam's assertion. On the other hand, after finishing the MOOC, a few students noted that they loved the experience as it helped them improve their thinking skills. For example, Rami a third-year student asserted "[The experience] was very good. It gives us – academic students who will become teachers in the future – the ability to explore new ideas ". Another student, Fadi asserted, "*The course opened new horizons for me, and new thinking skills I heard for the first time. Through this course, I gained new thinking skills and strategies. After the course I became a different person and benefited a lot from it."*

Students also noted the *professional development* aspect of the MOOC. For example, Jameel a third-year student asserted *"The topics covered in the MOOC helped me in the practical applications, as in how to conduct educational activities that help improve students' thinking skills and teach them how to think efficiently*." Another student, Sema noted that "*when you get to know the topic of Teaching Thinking, you realize how much*

you need to know the basics of this discipline, especially for college students who study to become teachers."

Many answers indicated that the MOOC helps in getting to know different opinions and share ideas with others. Distance learning emphasizes the role of the student in the learning process as a primary role and encourages *self-regulated learning*. For example, Abed a second-year student asserted: *"Through the MOOC I learned how to self-regulate my learning, explore new avenues, research, and introduce myself to new people and new opinions."*

Students also noted that learning via MOOC helped students think outside of the box and raise their awareness in good, *efficient critical and creative thinking*, which increased their *motivation and passion to learn as well as develop their 21st century skills*, and keep up with the developments of their technological time. For example, Tima a second-year student asserted "*The course helped develop my critical thinking skills by critically paying attention to detail, question things and issues, think differently and creatively, and critique ideas*." *Collaborative learning* was also noted as a result of the MOOC: for example, Salam a graduate student asserted "*The course helped develop the collaborative skills by doing assignments in small groups, through sharing ideas on WhatsApp groups or on the interactive board or sharing difficulties in Zoom meetings or online forums*." Another aspect was *enhancing technological skills*: Omer, a second-year student asserted "*I now know how to sign up for learning platforms and enroll in courses online. My keyboard typing skill has improved, and I can type faster. I now also know how to use digital tools, such as the interactive board and response threads, as well as looking up information and correctly phrasing it before writing*"

The students also showed their willingness to recreate the experience with passion and ambition due to the variety of *new pedagogic strategies* and *technological tools* that they witnessed. They noted that the course was unique from the other courses in that it is keeping up with the modern technological advancements that go in line with our daily lives. For example, Rula a graduate student asserted *"Captioned lectures, the use of digital tools that increase the motivation to learn, time-limited learning units, implementing the critical thinking questions which increases the pace at which information is internalized, the main question is thought-provoking, reviewing peers is a good challenge, as is getting exposed to new opinions."* Another student, Nada noted that "*The course includes many sections of society. The communication and follow-up by the teaching staff, the coordination and arrangement of the course, getting to know new ideas and new people: lecturers and colleagues from different disciplines, and the convenience and clarity of the course*."

Students also prefer distance learning because it *aligns with their abilities and time*, as they are not required to be present at specific hours for the lectures on campus. For example, Dana a second-year student asserted "*I advise my colleagues to enroll in the MOOC for many reasons: First, distance learners have self-commitment and can manage their time personally – they are not bound by specific times. This helps them succeed in the course. Therefore, I recommend they enroll voluntarily, not mandatorily.*". Another student, Reem asserted "*I am willing to enroll again in MOOCs,*

but I would prefer it if the student had the option to choose the MOOC according to their interests, and not have it be mandatory. I advise students to enroll in these platforms, but that they get to choose their topic."

The Relationships Between Learners' Motivation, Their 21st Century Skills and Their Grades in the MOOC.

To examine the relationship between the motivation components, the 21st century skills, and level of achievement of MOOC completers, the Pearson correlation coefficient was calculated for motivation components, the 21st century skills components, and level of achievement as shown in Table 1.

Table 1
Pearson correlation coefficient for motivation components, the 21st century skills components, and level of achievement (N=232)

	Grade (Achievement level)
Intrinsic motivation	-0.05
Career motivation	-0.04
Self-determination	-0.05
Self-efficacy	0.004
Motivation total	-0.04
Critical thinking	*0.53
Collaborative skills	*0.48
Creativity and innovation	-0.04
Self-direction	*0.38
Global connections	-0.15
Local connections	-0.14
Technology use	*0.31
21st century skills total	-0.03

The results of Table 1 show that there is a statistically significant positive relationship between achievement level(grades) and 21st century skills such as critical thinking ($r=0.53$, $p<0.05$), self-direction ($r=0.38$, $p<0.05$), collaborative skills ($r=0.48$, $p<0.05$), and technology use ($r=0.31$, $p<0.05$). However, the results demonstrate that there is no relationship between achievement level and motivation factors.

DISCUSION

The goal of this study was to examine motivation to learn and 21st century skills among teacher education students in a massive open online course (MOOC). Studies on motivation to learn in MOOC environments are not new (e.g., Hew & Cheung, 2014; Littlejohn et al., 2016; Milligan & Littlejohn, 2017); however, these studies based their findings on enrollees, while the current study purposefully examined the motivations of those who successfully complete MOOCs, especially in academic colleges of education. Although MOOCs were examined in the lens of quality standards, it is yet questioned by the pedagogical professionals about their outcome the 21st century skills from a student. The current study examined 21st century skills among teacher education students. Our main findings are summarized and discussed in the following paragraphs.

The Motivation of Teacher Education Students to Participate in "Teaching Thinking" MOOC

This study found that, at the beginning of the MOOC, teacher education students were motivated by intrinsic motivation, self-determination, and self-efficacy than they were by career motivation. Participant interviews pointed to the possibility that participants were intrinsically motivated to join the MOOC because of its novelty and introduction to new pedagogical strategies, especially that most of the participants were not exposed to this type of MOOCs prior to their participation. Participants showed higher levels of self-determination to successfully finish the MOOC. They also showed high levels of self-efficacy – the confidence in their ability to achieve high scores in the given MOOC. However, as they had not been exposed to the contents of the MOOC, as exhibited in the interviews, they did not have high levels of career motivation, and the MOOC's importance was not recognized to their careers as teachers.

This finding corresponds with extant researches (Bárkányi, 2021 Batchelor & Lautenbach, 2015; Liu et al., 2022; Loizzo et al., 2017; Milligan & Littlejohn, 2017 Romero-Frias et al., 2020). For example, in a study conducted by Batchelor and Lautenbach (2015), it was found that participation rates in MOOCs were high due to intrinsic motivation. It was also found that dropout rates were not an issue; students were highly motivated to complete their MOOCs, with only 15% not completing their MOOCs. Milligan and Littlejohn (2017) show that MOOC participants were intrinsically motivated – either through their interest in the topic or relevance and utility value.

Loizzo and colleagues (2017) show similar results to those reported in this study, which imply that self-directed learning and self-determination persist in MOOCs. It is also reported that adult learners have varied reasons for MOOC participation, such as interest in the MOOC topic, advancement of knowledge, and career changes. Batchelor and Lautenbach (2015) also report that MOOCs benefit participants in areas like independent learning, self-regulation, flexibility, and student engagement. However, they also point to challenges, such as the lack of self-regulation and self-directed learning skills among students. Similar results were also indicated by Badali and colleagues (2022) to those reported in this study, which imply that self-determination theory was used as the most dominant theory to support participants' motivation for MOOCs completion.

These results, however, are not in line with results reported by Sezgin (2020), which imply that preservice teachers (72.72%) were found to enroll in courses which were mostly related to their professional field and technical development domain. Career motivation is especially factored by pre-service teachers. According to Batchelor and Lautenbach (2015), 34% of pre-service teachers wanted to increase their subject knowledge. Still, 26% selected their MOOC based on their personal interest, and 8% to learn more about pedagogy. Notwithstanding, they report that 48% of the students tries to find MOOCs that combined subject matter that they found personally interesting (intrinsic motivation) with pedagogies (career motivation). It is speculated that this is due to the fact that the MOOC presented in this study was a mandatory course, as

opposed to the opportunity to select different MOOCs in Batchelor and Lautenbach's (2015) study.

After MOOC completion, intrinsic motivation and self-efficacy were shown to be relatively lower than it had been before the MOOC. This is because the MOOC was not made to fit the students' interests and expectations, as the registration for the MOOC was done to acquire academic points as a mandatory course in their academic program. In the interviews, students pointed to the importance that they are given the opportunity to choose the MOOC as it fits their interests, without any obligation.

Nonetheless, students maintained a consistent level of self-determination, suggesting that they persisted through the MOOC with the same levels of effort that they initially projected. It can be seen that at the end of the MOOC, an increase in career motivation was noted, as students learned the importance of learning pedagogical thinking strategies for teachers and students in the field.

These results complement similar results found by Barak et al. (2018), which emphasize the importance of self-efficacy on MOOC completion. The low levels of self-efficacy reported after completion can be attributed to the difficulties students faced during their experience of the MOOC, which was the first of its kind. Some of the students pointed to the fact that these courses require a lot of effort and time. Romero-Frias and colleagues (2020) report in their study that many students who completed the course presented high levels of both intrinsic motivation and extrinsic motivation. The results in this study partly support the results presented in their study, asserting that participants showed higher levels of career motivation after course completion.

21st Century Skills among Teacher Education Students

The finding of the study indicated that general level of 21st century skills among teacher education students before beginning the MOOC was relatively high, However, what is observed that teacher education students have higher levels of critical thinking and self-direction than all other skills. Significant differences in the levels of 21st-century skills among the participants before and after they had completed the MOOC were indicated. The participants displayed higher levels of collaborative skills, creativity and innovation, technology use, critical thinking and self-direction after completing the course than before commencing it. The MOOC of "Teaching Thinking" was designed to enhance collaborative learning, critical thinking creativity and innovation, technology use and self-direction. The objective of "Teaching Thinking" MOOC was to harness progressive pedagogy and progressive technology to bring order to and stimulate active engagement with this complex subject, while contributing to making learners both better teachers and better thinkers.

Through the course, the students were asked to work collaboratively in small groups, sharing ideas on interactive board or sharing difficulties in Zoom meetings or online forums. They also were asked to solve complex problems which contained peer reviews, critically paying attention to detail, think effectively and support critique ideas and innovative solutions for complex situations. Furthermore, following each lesson students were tasked with generating thinking maps to summarize the material presented in that unit. The MOOC Also included digital tools such as "Genially", Interactive board"

Padllet", and Thinking maps which enhance the use if the technology uses among students.

The findings of this research are consistent with extant literature in the field (Gamage et al. 2016; Karatas & Apraci, 2021; Puhek & Strmsek, 2019; Zotova et al. 2021). For example, the findings of Gamage and colleagues (2016) state that critical thinking was prompted in MOOCs which contained peer reviews and opened spaces to provide different solutions, which leads to believe that MOOC participation encourages critical thinking skills. The research, however, concluded that the majority of MOOCs are not driven to promote the collaborative structure, as 90% or more of the students claim that they have never been paired or put into groups to complete a task. As for communication skills, the research concluded that MOOCs provide the ability to produce presentation or written products few times during the course, using videos and blogs. However, more than 85% of the participants claim that they never used oral presentations in front of any student or teacher using technology. Creativity and innovation are defined as the opportunity to brainstorm solutions. Per this definition, the research suggests that more than 60% of the students claim they do not get opportunities to brainstorm. As such, the findings in this research partially correspond to the Gamage et al. (2016) findings in two categories: critical thinking and communication skills, while other categories such as collaborative skills and creativity and innovation pose different results.

The findings also confirm what Puhek and Strmsek (2019) show in their research about technology use, wherein they conclude that MOOCs in the business and management field supplied users with leadership skills, self-direction, and technology skills, among others. It was also found that the dropout rate in MOOCs is also influenced by the ability of users to show self-direction and goal and time management. The results of their research also point to the MOOCs' supply of innovation, communication skills, and critical thinking.

Karatas and Apraci (2021) report similar results to those reported in this study which indicated that 21st century skills are a strong predictor of students' readiness for online learning, and that individuals with 21st century skills are expected to have high levels of readiness for online learning. In addition, the research points to the positive correlation between an individual's ability to use technological tools and readiness for online learning, which is consistent with the findings in this research.

These results, however, are not in line with results reported by Gamage, Perera, and Fernando (2018), asserting that MOOCs need to be considered in introducing effective new pedagogies to promote 21 century skills specially collaboration, Interactivity and Networking).

The Relationships between Learners' Motivation, Their 21st Century Skills and Their Grades in the MOOC

The study indicated a statistically significant positive relationship between academic performance (students' grades in the different assignment) and 21st century skills, such

as critical thinking, self-direction, collaborative skills, and technology use. However, the results demonstrate that there is no relationship between academic performance and motivation factors.

These findings complement results found by Kan'an (2018) that students' 21st century skills scores were significant predictors of their academic achievement in science, reiterating that academic achievement is correlated to digital literacy and critical thinking. Critical thinking encompasses a variety of processes, mainly active conceptualization, implementation, analysis, and synthesizing, and evaluation of information. It also consists of universal intellectual values: clarity of thought, accuracy, consistency, relevance, evidence, good reasoning, depth, and fairness, among others. The results from this study point to the positive correlation between critical thinking and academic performance. This is in line with extant research. Karbalaei (2012) stated that promoting students' critical thinking abilities are necessary for academic achievement and personal success. Ben Youssef et al. (2022) and Pagani et al. (2016) showed that there is a positive and significant correlation between higher levels of digital skills and student performance, which corresponds with the findings in this study.

Self-directed learning skills are components that point to the student's self-direction aspects, such as the ability to set clear goals for themselves, align their learning process with goals and plans, monitor their learning process, and evaluate the outcomes of that process. It also implies the student's ability to show autonomy, self-motivation, openness and willingness to learn, and curiosity, as well as value learning, have self-control, and take initiative to learn (Brockett and Hiemstra, 1991). In our findings, self-direction skills are positively correlated to academic performance as well. This too corresponds to the existing research (Chou, 2012; Khalid et al., 2020; Khiat, 2017; Vargas et al., 2018; Zhoc et al., 2018). Self-direction learning proved to have a positive relationship with student achievement in Khalid et al. (2020)'s study, where a positive correlation was observed between self-direction and academic achievement. These results also partly complement what Khiat (2017) posited in his study, which showed that self-directed learning skills were positively correlated to academic performance. However, it also showed, contrary to the results found by this study, that online class readiness, i.e., technology use did not have a significant effect on academic performance, though this may be attributed to the little use of synchronous online presentations at the time of conducting said study (Khiat, 2017). The positive correlation between self-direction and academic achievement was also emphasized by Zhoc et al. (2018), who showed that self-directed learning positively affects the GPA, as well as students' development of generic outcomes, such as social and cognitive outcomes.

The results of this study show a positive correlation between collaborative skills and academic performance, which confirms results reported by Vargas et al. (2018), who found that students who collaborate significantly with many different people tend to achieve higher homework grades and better academic performance.

RESEARCH IMPORTANCE AND FUTURE DIRECTIONS

MOOCs are newly integrated in the Israeli educational system, aim to provide quality content on a mass scale. The effectiveness of this integration needs to be studied from different perspectives. This study contributes to the evaluation of the effectiveness of MOOC learning for education students, and maybe beyond. Having the accessibility to the learning content in MOOCs, needs to meet learner motivations in order to achieve learning goals. In addition, MOOC learning should contribute to the main learning objectives in the current century; developing personal, life and career skills. This research tries to answer the question whether, and in which degree MOOCs contributes to the 21st century skills. The results of this study may also contribute to rethink the design of MOOCs for education students. Future studies may examine relationships between motivation to learn in MOOCs and intrapersonal variables that lead to enhance 21st century skills, and more research can be done about hots (Higher-order thinking)

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