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Preface

This issue reveals the continued global interest in self-directed learning as a field of inquiry.

In the first article, Hashad presents the findings of an exploratory mixed method design used to examine the self-directed learning of young college graduates in Egypt. Specifically, motivation and the role of information and communication technologies tools that support personal learning were investigated. The quantitative phase (n = 135) and the subsequent qualitative phase (n = 12) reveal the important role of these tools in facilitating self-directed learning.

Next, Katz and Westera investigated the difference in performance of Dutch students (n = 150; age range: 12-15 years) in a physical education lesson when subjected to varying levels of autonomy in learning. Findings suggest performance to be positively influenced by autonomy with a greater benefit realized by higher performers.

In the final article, Zhu and Bonk present the findings of another sequential mixed method design used to examine the perceptions of self-directed learning among massive open online course instructors. The qualitative phase (n = 4) and the subsequent quantitative phase (n = 48) indicate that the instructors believed self-directed learning skills to be teachable via instructional design. Strategies to promote self-directed learning are addressed.

All of these articles support the important, productive role that educational professionals play in providing facilitative tools and instruction that promote self-directed learning. I thank the authors for sharing their findings and insights with our readership.

Michael K. Ponton, Editor

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CONTENTS

THE IMPACT OF ICT ON THE PRACTICE OF SELF-DIRECTED LEARNING AMONG YOUNG ADULTS IN EGYPT

Dalia Hashad

This study explored the self-directed approaches to learning that young adults in Egypt pursue after college graduation through examination of their motivations for learning as well as the influence of the tools of Information and Communication Technologies (ICT) on their self-directed learning experiences. Using a mixed method design, a total of 135 participants responded to an online questionnaire for the quantitative phase. Twelve of the questionnaire respondents were randomly invited to conduct face-to-face interviews for the qualitative phase of the study. The results of the study indicate that the participants were mainly motivated by the desire to enhance their professional skills, the need to pursue personal interests or learn certain skills, and the need for self-improvement. The tools of ICT were found to facilitate self-direction in learning with participants showing a higher preference for online learning platforms and an extensive utilization of the various tools of ICT in their learning practices.

Keywords: self-directed learning, adult learning, ICT, online learning

Although Egypt has one of the largest education systems in the world with more than 16 million students enrolled in various educational levels, the formal education system in Egypt has failed to equip the Egyptian youth with the necessary skills and knowledge for thriving at the current marketplace (Handoussa, 2010). Youth unemployment is stated to be higher than the total rate of unemployment in Egypt with estimates of 16% for those between 15 and 29 years of age (Said & European Training Foundation, 2015).

One of the main reasons stated for the continually increasing rates of unemployment has been the gap between what the schools and universities teach and the actual needs of the job market (Loveluck, 2012). For instance, higher education in Egypt is reported to provide students with outdated content, poorly equipped facilities, and a focus on content memorization (Handoussa, 2010).

Furthermore, the inadequate quality of the state-provided free public education has led to the emergence of private educational settings. Even though private education is of a higher quality, it plays a dominant role in feeding the social inequality already witnessed in the Egyptian community. Graduates of private education often have a better opportunity at finding jobs than their peers from public education (Loveluck,

2012). Young college graduates, especially those who could not afford private education, are left to face the challenges of unemployment and the need for developing their own skills and filling in knowledge gaps in order to create an opportunity for themselves in the job market.

Adopting a self-directed approach to learning would assist young adults in Egypt with compensating for the knowledge gap and would allow them to develop the skills necessary for lifelong learning. Self-directed learning (SDL) as defined by Malcolm Knowles (1975, as cited in Loyens, Magda, & Rikers, 2008, p. 414) is the process "in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes."

Even though we live in an age of an unprecedented pace of change that necessitates the development of self-directed learning skills, Candy (2004) believed that the current advent in Information and Communication Technologies makes it possible for learners to independently acquire knowledge more so than in previous times. As defined by Hamelink (1997),

> Information and Communication Technologies (ICTs) encompass all those technologies that enable the handling of information and facilitate different forms of communication among human actors, between human beings and electronic systems, and among electronic systems. These technologies can be sub-divided into capturing, storage, processing, communications, and display technologies. (p. 3)

Digital technologies allow for endless resources of information to be available online for everyone to use. With various types of knowledge presented in different forms, learners with different learning styles can find the resources that suit them best (Candy, 2004). Recent surveys about the use of ICT in the Egyptian society have revealed that the majority of Internet users are young adults between the ages of 15 and 29 and that a substantial percentage of the Internet usage is for the purpose of education and learning (Said & European Training Foundation, 2015). Although self-directed learning does not necessarily have to be pursued online, the abundance of unlimited and mostly free resources on the Internet provides a valuable opportunity for those who have been failed by formal education systems to compensate for knowledge and skill gaps. Moreover, students who cannot afford private schooling can access online courses developed by the top tier universities of the world thereby combating the social inequality aspect of formal private settings.

Research studies conducted in Egypt on the educational pursuits undertaken outside formal education settings are mostly investigating the literacy programs designed for adults, youth, or children who have dropped out or have not joined formal education options (Sywelem, 2015). Almost no research has been conducted on the self-managed learning activities carried out by young Egyptian adults after leaving the formal education setting. No literature is found on whether or not young adults in Egypt are actually practicing self-directed learning as a way to overcome the previously

mentioned challenges they face after graduating college. Additionally, there is a clear shortage in the research conducted to identify the learning approaches for which young Egyptian adults have been reported to be using ICT tools.

On the other hand, a plethora of global research has been made for the study of SDL and the influences of the tools of ICT on self-managed learning experiences over the last decades. Studies on the motivations for practicing SDL as well as on the effect of ICT on the learning experiences of self-directed learners have particularly guided the current study with exploring and describing the pursuits of young adults in Egypt practicing SDL in light of the current advent in ICT.

Motivations for SDL

Self-directed learners are postulated to be driven by an inner desire to improve and achieve progress in an area that they view as meaningful to them (Sheu, Lee, Bonk, & Kou, 2013). More specifically, studies have shown that motivators for SDL include personal interest, curiosity, enjoyment of learning, seeking certain information for retrieval or for expanding existing knowledge, as well as learning to acquire new skills or improve personal skills (Bonk, Lee, Kou, Xu, & Sheu, 2015; Loizzo, Ertmer, Watson, & Watson, 2017; Sawatsky, Ratelle, Bonnes, Egginton, & Beckman, 2017; Sheu et al., 2013). Adults also pursue SDL to improve professional skills (Bonk et al., 2015; Loizzo et al., 2017), feel better about their jobs (Cercone, 2008), and form their professional identity (Sawatsky et al., 2017).

Some motives for adults' SDL extend outside themselves such as learning for the desire to help others (Bonk et al., 2015) and to connect with other people (Loizzo et al., 2017). Others practice SDL as an expression of their freedom of choice to learn (Bonk et al., 2015) as well as their sense of competence and personal responsibility (Sawatsky et al., 2017).

SDL and the Use of ICT

Many educational institutions have adopted an open and technology-based approach to education thereby making their courses accessible online and for free, shaping what is now called the Open Education Movement (Lin & Cranton, 2015; Luna Scott, 2015). Open education allows for the abundance of free and unlimited access of high quality resources for public benefit, resulting in numerous platforms of knowledge such as OERs (open educational resources) and MOOCs (massive open online courses) as a primary choice for over hundreds of thousands of learners all over the world (Lin & Cranton, 2015; Schulze, 2014; Sheu et al., 2013).

Studies on the impact of ICT tools on learning report that these tools such as the Internet, mobile devices, social media, file-sharing platforms, and various software programs provide learners with unlimited online resources. Therefore, learners are able to have control over their learning process that allows them to learn new skills, enhance their performance at their jobs (Bonk et al., 2015), and construct knowledge that is more relevant to their real life situations (Firat, Sakar, & Yurdakul, 2016). Overall, the

use of ICT is considered to promote the development of the skills for self-direction (Maloney, Tai, Paynter, Lo, & Ilic, 2013).

Challenges to SDL

The need for external guidance has been stated repeatedly as among the challenges that self-directed learners face during their self-driven pursuits (Bonk et al., 2015; Sawatsky et al., 2017). Other challenges reported by self-directed learners include difficulties with sustaining self-motivation (Schulze, 2014), identifying learning needs and translating them into learning objectives, finding suitable resources for learning (Sawatsky et al., 2017), and the lack of sufficient time (Loizzo et al., 2017; Sawatsky et al., 2017).

The practice of SDL online imposes a different set of challenges upon learners. Self-directed learners reported the lack of human interaction as a downside to the online experience (Bonk & Graham, 2012). Also, learners struggle with evaluating and allocating good quality resources from the "overwhelming" pool of online resources (Bonk et al., 2015; Schulze, 2014) especially since peer feedback has not always been found to be reliable (Schulze, 2014). Additionally, the course design itself has been reported as an influencing factor in the success of the online SDL experience (Loizzo et al., 2017).

Purpose of the Study

There is a gap in the literature related to the independent pursuits of learning undertaken by young adults in Egypt after college graduation and how the use of the ICT tools affects those self-driven pursuits. This study aimed to explore and describe the practice of self-direction among young adults in Egypt through examining the following research questions:

RQ_1: What are the motivations behind the SDL practices undertaken by young adults in Egypt?
RQ_2: How do young adults in Egypt utilize the tools of ICT in their SDL practices?
RQ_3: How do young adults in Egypt perceive the impact of ICT on their SDL experiences?

Method

This study followed an exploratory sequential mixed-method design. The quantitative phase of the study applied a nonexperimental descriptive design in which the primary aim was to identify the motivations of young adults in Egypt to initiate self-driven pursuits of learning. It also aimed to analyze the different settings for learning and the aiding tools of ICT adopted by young adults in Egypt. For further interpretation of the quantitative data, the qualitative phase of the study was conducted through semistructured interviews to investigate the participants' perspectives on their motivations for learning and the impact of ICT on their learning experiences.

Quantitative Data Collection

An online questionnaire (see Appendix) was selected as the tool of quantitative instrumentation and was delivered in English. The questionnaire was estimated to take from 10 to 15 minutes and was designed to cover three main areas of investigation echoing the research questions:

- Personal Information: This section served at providing general profiles of the participants joining the study: age, gender, English language mastery level, and ICT proficiency level. An intermediate level of English and ICT proficiency was mandatory for participation in this study. Questions to assess the ICT proficiency were founded in the available literature on assessing awareness and familiarity with the ICT tools for the purpose of online learning success (Bernard, Brauer, Abrami, & Surkes, 2004).
- Self-direction in Learning - Initiation and Motivation: In this section, the extent of initiation of self-driven pursuits of learning among the respondents was examined as well as the motivations that have driven those who actually initiated an SDL experience. The items for this section were rooted in the latest measurement tools of SDL reported in the literature with proven validity and reliability (Fisher, King, & Tague, 2001; Williamson, 2007).
- Utilization of ICT tools: Since this study was aimed at investigating the impact of the advent of ICT on SDL, the extent and nature of ICT usage in different SDL experiences can be used as an indicator for its impact (Bonk et al., 2015; Firat et al., 2016; Sheu et al., 2013).
- To evaluate the extent of reliance on the various tools of ICT, the participants were asked about the methods they used for locating the resources for their SDL pursuits in addition to the learning settings and the types of learning resources that they mostly relied on for their self-driven learning practices.

Qualitative Data Collection

The qualitative phase was conducted through semistructured, face-to-face interviews that lasted around 20 minutes. The interview sessions were conducted through a set of specific and open-ended questions in which participants were asked to elaborate on their learning experiences through describing the learning settings they used, their motivations, and how the tools of ICT influenced their SDL process (see Appendix).

Sampling

Participants were selected using purposeful sampling. In particular, the typical case sampling and snowball sampling techniques were used. In typical case sampling, the participants who match the selection criteria were invited to participate in the study. The selection criteria for the sample included individuals within the age range of 21-30 years and who had graduated from college. Further participants were reached using the

snowball technique by which participants who have already joined the study were asked to connect the researcher to other participants who matched the study criteria (McMillan, 1996).

Sample Size

The drop-out percentage is estimated at 10% for a sample of 100 participants and 2% per 100 questionnaire items (Hoerger, 2010). For this study, the aim was to reach a count of 100 responsive participants. Therefore, the target sample size was 112 to compensate for the drop-out estimate.

For the qualitative phase, 10 to 15 of the questionnaire respondents were randomly selected and invited to conduct a face-to-face interview session.

Pilot Study

For the pilot study, 12 participants were asked to take the questionnaire, and 2 of them were asked to conduct a face-to-face interview. The questionnaire had a feedback section in which participants could share their comments regarding the questionnaire items. Also, after the two pilot interviews, participants were asked about their feedback regarding the interview questions and setting. The pilot study resulted in a few valuable modifications to the data collection instruments and allowed for the identification of any technical issues associated with conducting the questionnaire online and their fixation before the initiation of the parent study.

Ethical Considerations

This study adhered to the research guidelines and research governance framework stated by the University of South Wales. All tools of instrumentation and documents were approved before the commencement of the data collection for the study. All participants provided their informed consent before participating in the study with the freedom to withdraw at any time. Interview sessions were recorded upon participants' consent. All forms of collected data were retrieved anonymously and made accessible only to the researcher.

Findings

Quantitative Data

The online questionnaire received a total of 135 complete responses. Of the total respondents, 49% were females and 51% were males, providing an almost equal representation of both genders. All respondents were within the age range of 21-30; specifically, approximately 32% were within the range of 21-25 and 68% were within the range of 25-30. All respondents were Egyptians and residents of the capital city Cairo.

Data indicate that almost all the respondents acquired an English language

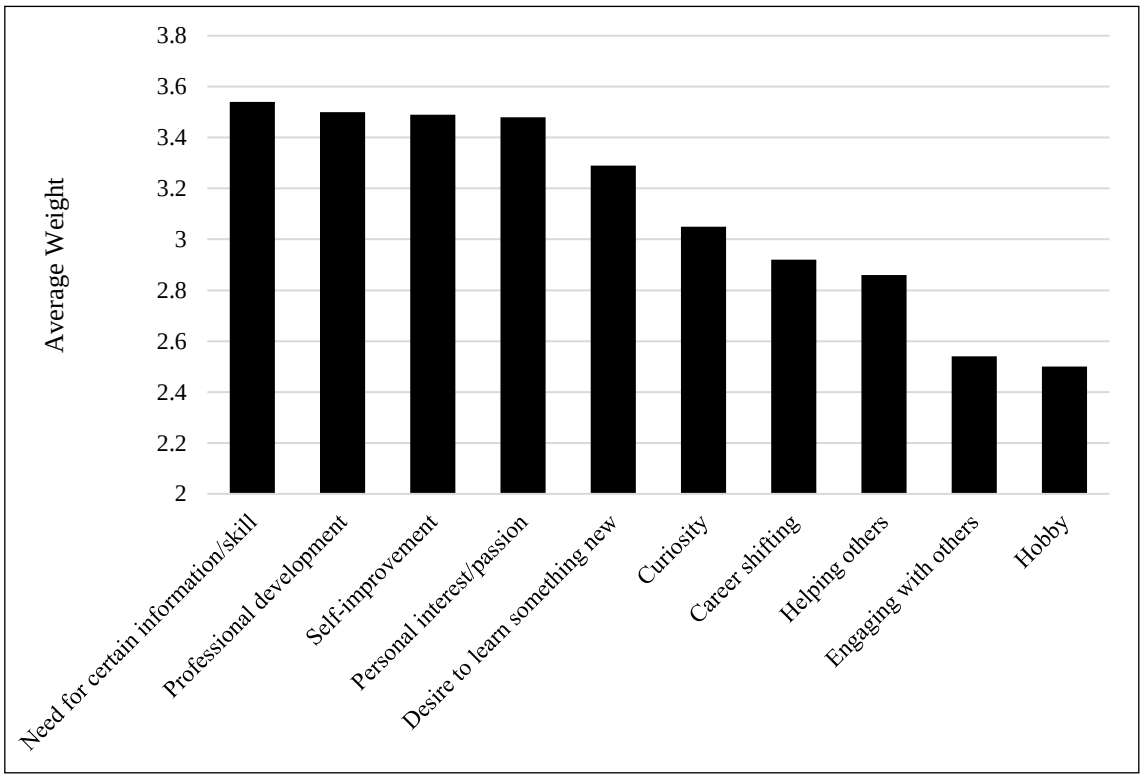
proficiency level of intermediate or above; 74% of the respondents were at an "advanced" or "fluent" level and 24.5% at an "intermediate" level.

Three items were used to assess the ICT proficiency among the respondents: the ability to use the computer, ease with Internet searching, and comfort with communicating electronically. There was an overall agreement among all respondents toward the three items. Approximately 70% of the respondents gave a response of strongly agree with the first two items whereas a slightly smaller percentage of 51% strongly agreed to the item of "comfort with communication electronically" thus indicating a possibility of less ease toward online communication.

Self-direction in learning. The respondents' learning experiences after graduating college were examined through questions about the extent of initiating learning and the motives for learning.

Initiatives for learning. The data revealed that most of the respondents (93%) have indeed taken the initiative to learn after graduating from college.

Motivations for SDL. As shown in Figure 1, the average weights of the different motivational factors show that the need for certain information or skill was rated the most motivating reason for SDL. Strongly motivating factors also included enhancing professional skills and self-improvement followed closely by the desire to pursue a personal interest or passion and to learn something new. Interestingly, curiosity and career-shifting were approximately rated as moderately motivating reasons for SDL. Respondents considered learning to engage with others or to have fun among the least motivating reasons for SDL.



Note. Likert scale: 1 = *Not motivating at all*, 2 = *Slightly motivating*, 3 = *Moderately motivating*, 4 = *Strongly motivating*.

Figure 1. Motivations for SDL.

Utilization of ICT tools. The participants were asked about their methods for locating learning resources, the learning settings they used—whether online or offline—and the specific learning resources they used in online platforms.

Methods for locating learning resources. As presented in Figure 2, the majority of the respondents relied on the Internet to identify and locate learning resources. Second to the Internet, the respondents seemed to depend on their friends and colleagues followed by social media. Slightly fewer participants sought recommendations from work. Among the methods least utilized for identifying resources were emails, newsletters, blogs, and podcasts.

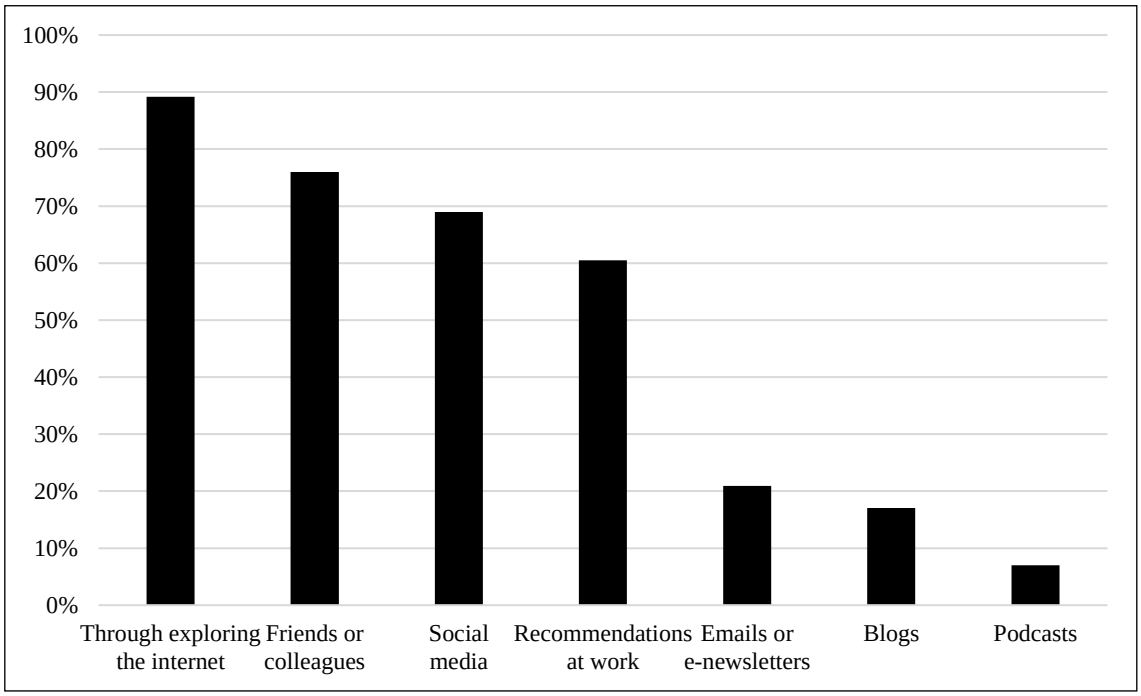


Figure 2. Methods for locating learning resources.

Learning settings. A learning setting is referred to as the physical or virtual environment where teaching and learning takes place. In the context of the current study, learning could occur either in an offline learning setting such as registering for a course in a university or in a virtual setting such us learning through online platforms as MOOCs and the Internet in general. As shown in Figure 3, most of the respondents used online platforms for learning either exclusively (39%) or in association with offline learning settings (45%). The data also indicate that offline learning settings are not entirely dispensable as they were being solely used by 16% of the participants.

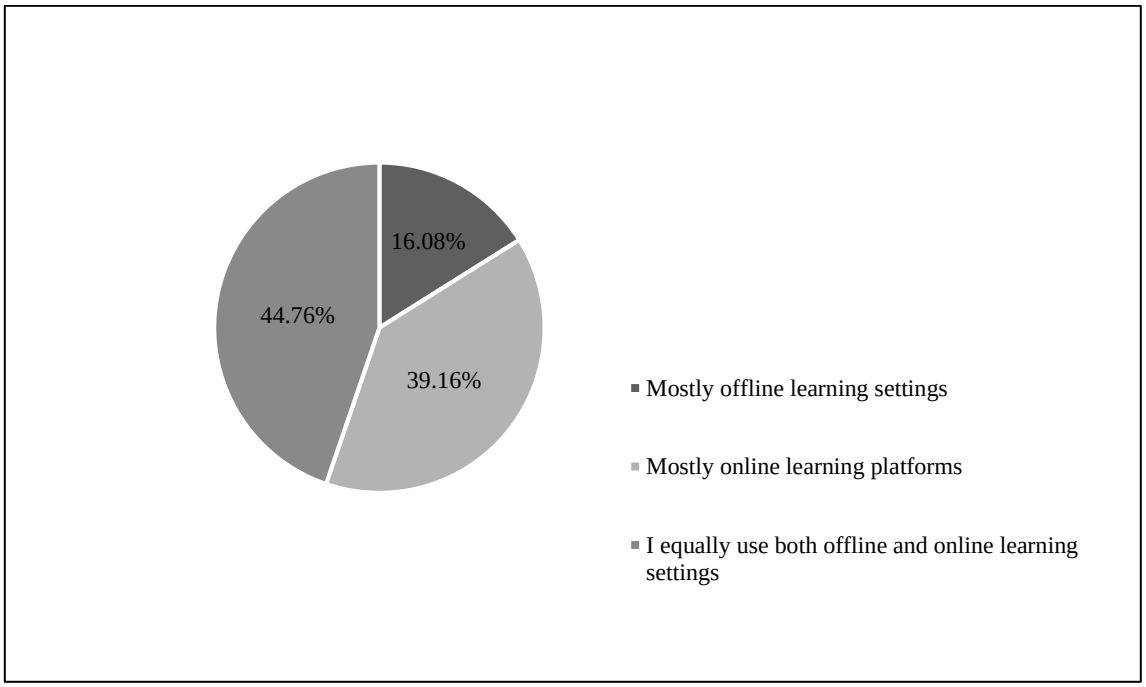
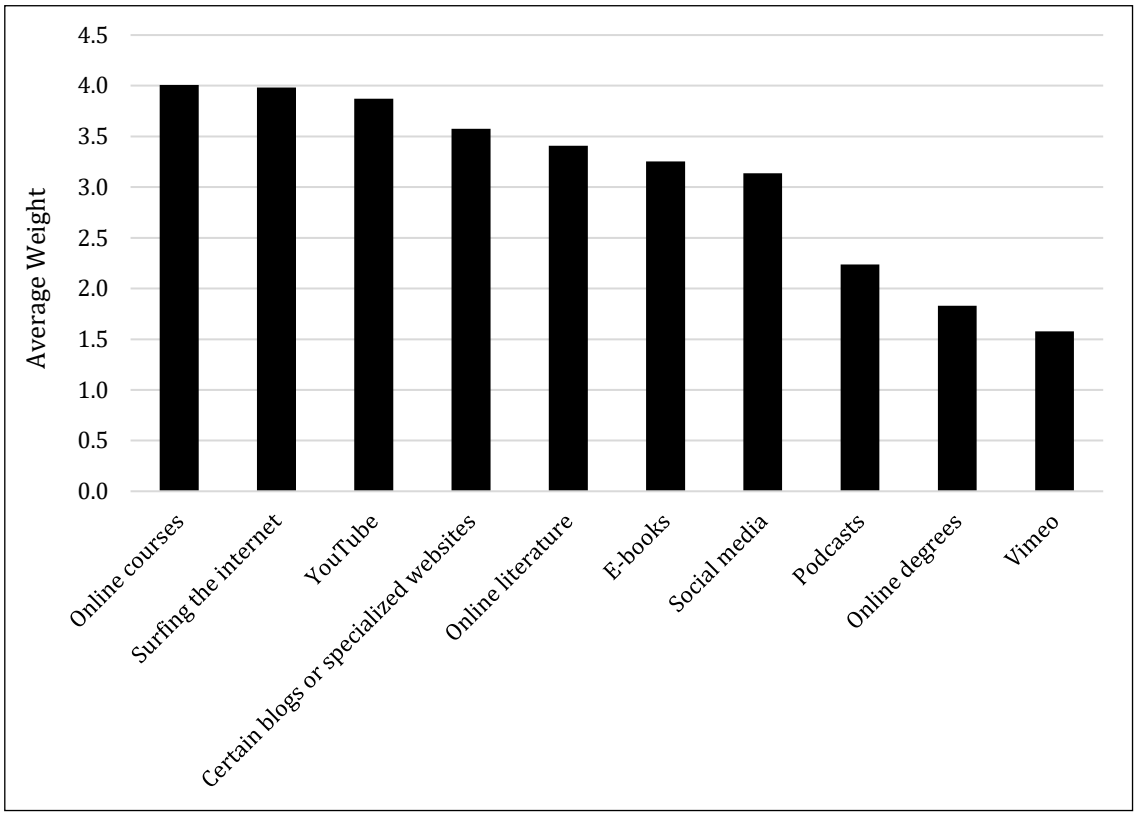


Figure 3. Learning settings.

Resources for learning in online settings. Figure 4 shows that among the various types of learning resources available on the Internet, online courses and randomly surfing the Internet were rated as the most frequently used resource for online SDL experiences. At the same time, the respondents seemed to rely heavily on watching YouTube channels for their online SDL experiences. This indicates that online self-directed learners sought to learn from organized and predesigned resources such as online courses while at the same time learners practiced SDL through customizing their own learning resources according to their specific needs using unorganized online content.

Many of the respondents also sought certain specialized websites and blogs whereas online literature, e-books, and social media were reported as resources that were sometimes used for online SDL. Relatively fewer respondents reported using podcasts. Interestingly, the data show that online degrees were among the least frequently used resources for online SDL, which implies that online self-directed learners do not consider formal certifications as a priority.



Note. Likert scale: 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Very often*, 5 = *Always*.

Figure 4. Online learning resources.

Qualitative Data

Twelve of the questionnaire respondents were asked to share their insights about their learning experiences with respect to their motivations, the learning settings, and how the tools of ICT influenced the different steps in their SDL practices.

Motivations for SDL. As shown in Table 1, among the most frequently stated motivations is the need to develop a professional skill for meeting job market requirements or to enhance professional skills for an existing job. On the other hand, multiple participants were driven by the ambition to start a new career entirely. Moreover, participants repeatedly expressed the desire to learn in order to pursue a passion or an interest that they always wanted but never got the chance to explore. Other participants were driven by their curiosity about certain topics. A few participants found the activity of learning "enjoyable in itself" while others felt an urge to learn in order to keep up with constant changes. Interestingly, one participant viewed his goal for practicing lifelong learning as a fulfillment for his role as a parent; that is, to support his children by being a "well-educated and knowledgeable father." Among

the valuable findings concluded from the participants' insights was that their motivations for learning changed over time and differed according to their life plans at that stage of time.

Table 1. *Motivations for SDL*

Motivations	Participants' Supporting Quotations
Curiosity	"I was curious to learn about areas of knowledge that I knew nothing about."
Following passion/personal interest	"I have so many ideas for projects that I feel passionate about and I wish to learn about them."
Professional development	"The main motive at first was to develop the skills required by the job market in order to find an opportunity that will satisfy my financial needs. After that, my goal for learning was to excel in my profession."
Career shifting	"For me, I wanted to explore a new career. So, I took the decision to walk away from my field of study and start developing my knowledge and skills in the new field I chose."
Need for lifelong learning	"I initially pursued learning to follow my passion for Physics. But now I realized that the world is changing around me. So, I am also learning to keep track of the latest updates."

Learning settings. All the participants stated that they used online learning resources for their learning pursuits after graduating college. Out of the 12 participants, 9 reported using online platforms as the primary setting for learning. Conversely, the remaining three participants stated that they used both online and offline settings for learning activities.

Impact of ICT tools on learning practices. The insights shared by the participants on how the tools of ICT influenced their learning practices fell into two main categories: the benefits of using ICT tools in the different steps of the SDL process and the challenges faced in ICT-supported learning experiences. The following paragraphs illustrate the themes that were generated from the participants' reflections with examples of supportive statements.

Benefits of using ICT tools in the process of SDL.

- Formulating Learning Objectives

The Internet allowed the participants to explore different areas of learning thereby enabling them to identify the gaps of knowledge that they wished to learn about. As one of the participants explained, "the internet helped me stay aware of the latest updates in the different fields."

Specialized websites, online forums, and social media platforms were reported by the participants as a means for expressing their inquiries and seeking support with identifying and formulating their learning objectives.

The online forums helped me increase my awareness of what I need to learn, and even gave me useful insights into my offline learning plans as well.

I search for highly credible universities on the internet and reach out to scholars whom I wish to have their advice. Even if not all of them respond, I know at least one of them will, and that would be very helpful to me.

- Identifying and Evaluating Learning Resources

The participants expressed several attributes of online resources that facilitated the allocation of the necessary material for their learning objectives. Firstly, the accessibility and abundance of resources; almost all the participants considered access to unlimited resources among the most valuable benefits for their SDL experiences. As stated by one of the participants, "now I have access to learn the things that I couldn't learn before."

Secondly, the diversity of media resources; there is a plethora of various forms of content such as videos, audios, and texts. Participants praised the ability to freely choose the type of learning material that suited their own learning preferences and styles.

The fact that I can find different types of content for the same concept; an article, a video, or a book, each addressing the concept in a unique way is outstanding to me and makes me want to learn even more.

For the assessment of learning resources, some participants relied entirely on the credibility of the institution providing the resource and the course information. A few participants followed certain authors who had proven expertise in the field at hand. Other participants depended on directly asking experts for guidance.

In time, I became capable of evaluating the learning resource on my own and decide whether it will be valuable for me or not. I now mostly rely on checking

the course specifications, the course ratings and the previous learners' reviews on the course.

- Planning for Learning

The participants again seemed to value the online learning communities, online forums, and social media platforms for providing access to guidance and shared experiences. Additionally, online courses or MOOCs were reported as helpful at visualizing a strategy for learning through the organized structure of the online courses and the preset learning steps.

I got to know about some certifications that I have never heard [of] before through the social media. I now have friends on Facebook that I have never met, but we share the same interest and help each other with learning. I got to know about reputable scholars who have so many followers on Facebook.

- Implementing Learning Strategy

The tools of ICT were reported to facilitate the participants' learning experiences in multiple ways. Different devices such as laptops, iPads, and tablet devices facilitate learning "anywhere and at any time." Downloadable resources also allowed participants to study in the absence of an Internet connection particularly "on the way to work." Mobile applications were also reported useful for time management.

The flexibility of timing and the liberation from preset deadlines were reported as beneficial aspects to the ICT-supported learning experience as it made it more convenient, time efficient, and flexible for learning at one's own pace. As one of the participants explained, "I am someone who gets bored easily. So, online learning allows me to skim through various resources and learn at my own speed."

In general, almost all participants considered the tools of ICT indispensable for their SDL experience. Most participants attributed their ability to learn independently after college to the tools of ICT—above all the Internet—whereas others stated that "it would have been really difficult" to learn without them.

To me, the internet is the best invention in history. Most of my studying is on my laptop, I manage my study time using a mobile application, and I use certain websites to learn about the latest courses, while MOOCs help me track my learning.

Moreover, participants expressed that the acquired knowledge from their SDL experiences was more enjoyable and more relevant to real-life situations as they learned for a clear goal.

> *In college, we couldn't see the bigger picture; how what we learn is actually connected to work or its applications in life. But after graduation, we learn for a specific objective in mind; to enhance work or to solve a specific problem.*

> *Learning that is driven by interest is much easier, and results in better learning outcomes than studying something only because you have to.*

Challenges. One of the most reported challenges discussed by the participants was the ability to self-manage their time. Commitment to the learning goals in the absence of confining schedules and deadlines was also regarded as challenging to most of the participants.

> *The absence of deadlines makes it easier to postpone and makes it harder to commit to your learning plan.*

The online medium also imposed some challenges for self-directed online learners. The lack of human interaction was considered a drawback to the online learning experience. As explained by one of the participants, interacting with others is mandatory for a complete learning experience:

> *To me, online self-learning does not provide a complete learning experience because it lacks the reflective interaction with others. It is not enough to learn on your own.*

Moreover, having to spend too much time learning online was reported as a discomforting, and was regarded as a deficiency to the online SDL experience:

> *I think that online learning will result in a generation that is lacking the necessary interpersonal skills developed in face-to-face learning interactions, like communication skills and teamwork. I've seen young people applying for a job at my work; they have very good technical skills, but they are lacking the necessary skills for productive human interaction.*

Many of the participants reported a sense of hardship due to the lack of guidance and the need for external support. Having to "figure out everything on your own" was regarded as a difficult task by several participants. Most of the participants perceived the skill of evaluating learning resources as one that "can be acquired and is developed with time and practice."

> *I trust my abilities in searching for resources and setting my own learning plans. But I feel that if I had started off with more information than I had, or if I had an expert to support me, my learning experience would have been easier.*

Discussion

The aim of this study was to explore the SDL pursuits of the young adults in Egypt in light of the current advent of ICT tools. Both qualitative and quantitative methods provided a comprehensive understanding of the research questions for this study.

The numerical data revealed that the majority of participants, in fact, took the initiative to pursue learning after finishing their formal education. Reinforcing the findings of earlier studies, both types of data in this study revealed that the motivations for SDL pursuits included the need for professional development, self-improvement, following a personal interest, seeking certain information for expanding knowledge, or curiosity (cf. Bonk et al., 2015; Cercone, 2008; Loizzo et al., 2017; Sawatsky et al., 2017). The quantitative data in this regard were particularly valuable at quantifying the priority of the various motivations among the participants while the qualitative analysis highlighted further motivations for learning among the participants such as learning for helping others (cf. Bonk et al., 2015) and for the enjoyment of learning itself (cf. Loizzo et al., 2017; Sawatsky et al., 2017).

On the impact of ICT tools on the practice of SDL, the findings of this study were consistent with earlier studies that identified online learning as a primary resort for many learners (Lin & Cranton, 2015; Schulze, 2014; Sheu et al., 2013). However, the quantitative findings in this study also highlighted that most of the participants relied on both offline and online learning settings, showing that offline learning settings are still necessary for self-directed learners. The qualitative data were beneficial at investigating the reasons behind the respondents' preference for online learning platforms. At the same time, the participants' insights regarding the challenges associated with online learning platforms explained the quantitative data that showed a number of participants still seeking to learn using offline settings only.

In alignment with the findings of recent studies on how the utilization of ICT tools result in higher levels of self-direction in learning (Maloney et al., 2013; Rashid & Asghar, 2016), this study revealed that the progress of the various tools of ICT made it possible for young adults in Egypt to conduct their self-driven pursuits of learning and promote the practice of the various learning activities involved in the process of SDL as defined by Knowles (as cited in Loyens et al., 2008).

Young adult learners who participated in this study perceived their SDL experience as "impossible" to conduct without the different tools of ICT and especially the Internet (cf. Bonk et al., 2015; Rashid & Asghar, 2016). As found by Schulze (2014), the Internet allows learners to seek guidance by communicating with online learning communities through social media and discussion forums. Young adult learners are also capable of locating and evaluating learning resources through the unlimited access to high-quality resources online. Social media and online learning communities also assist learners with formulating their learning strategies (cf. Schulze, 2014). Implementing the various activities for learning also involved the use of various tools of ICT such as mobile devices for learning at different places and at flexible times (cf. Bonk et al., 2015) as well as mobile applications for managing time.

The research identified the key advantages that young adults perceive about their ICT-supported SDL experiences. Most prominently, young adult learners value

the ability to have an individualized and convenient learning experience owing to the abundance of unlimited high-quality resources, the ability to freely customize their learning resources according to their interests and needs, the flexibility of learning timing and place (cf. Bonk et al., 2015), and the opportunity for a self-paced learning experience. Additionally, self-directed learners are able to construct knowledge that is more relevant to their real-life situations as also concluded by Firat et al. (2016).

On the other hand, the self-management of learning did not pass without challenges. The qualitative analysis for this study revealed the areas where the participants expressed feelings of hardship in their ICT-supported SDL experiences such as commitment to learning plans, formulating learning goals, and assessing learning resources. The lack of sufficient guidance and support (cf. Bonk et al., 2015; Sawatsky et al., 2017), the lack of human interaction (cf. Bonk & Graham, 2012) as well as difficulties with time management (cf. Loizzo et al., 2017; Sawatsky et al., 2017) were also stated as challenges to the practice of SDL.

Limitations

Due to time constraints, the research sample was limited to a specific demographical area. Most of the participants were from Cairo, imposing a limitation to the generalizability of data. The number of respondents was also limited, and further information about the educational level and years of graduation would have been valuable to the research. The age group represented in this research is quite broad; thus, future research should focus on a narrower age range and provide a more specific profiling of the respondents. Additionally, data instrumentation has not been validated. Quantitative data were collected through self-reporting and self-rating. Self-reported data imposes a limitation to reliability as it depends entirely on the truthfulness of the respondents. Finally, the research has been entirely conducted by only one researcher. Therefore, there is a potential for subjectivity in processing and in reporting the findings.

Conclusion

The research resulted in an exploratory examination of the learning experiences that young adult learners in Egypt pursued after college graduation and how the abundance of ICT tools affected their self-driven learning pursuits. The study revealed the significance of SDL for achieving professional development as well as pursuing personal passions and starting new careers. The study examined the extent of utilization of ICT tools and highlighted the aspects of technologies that are highly appreciated by self-directed learners as well as the areas that were perceived as challenging.

This study informs educators about the natural tendencies and learning behaviors of young adult learners in Egypt when given the freedom to pursue learning outside the confinements of formal learning settings. The study also helps with directing future actions for optimizing the learning experiences of self-directed learners and encourages further research into how the technologies can be best incorporated to meet the needs and preferences of young adult self-directed learners in Egypt.

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Appendix

Data Collection Tools

1. Online Questionnaire

For the online questionnaire, the participants were asked to respond to a total of 15 questions. The questionnaire was estimated to take from 10 to 15 minutes. A variety of question formats have been used for the questionnaire, including multiple choice questions, ranking questions using the Likert scale, multiple-response questions, close-ended questions and open-ended questions.

Provided below are a few examples of the questions that were presented to the participants in the online questionnaire:

- What motivates you to pursue learning after college graduation?
- Would you please specify the setting through which you mostly pursue your learning after college graduation?
- What resource do you mostly choose for learning offline/online after college graduation?
- What tools of ICT do you use for implementing and managing your learning?
- For the following statements, please describe your opinion through selecting the most accurate response:

Statement	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I feel responsible for my own learning						
I can identify my learning needs						
I am able to locate good quality resources of learning						
I am able to assess my own progress during learning						
I am able to make modifications to my learning strategy based on my self-assessment and reflections						

2. Interview Schedule

Semistructured questions were used for the interview in which the questions were specific, yet open-ended (i.e., without a predetermined set of answers). The interview session was estimated to take 20 minutes, and the interview questions were grouped under certain topics that reflected the same areas of investigation in the online questionnaire:

a. *Learning experiences after graduation*. Participants were asked to elaborate on their learning experiences through describing the learning settings they use, their motivations, and how their self-driven learning experience differed from earlier formal education.
b. *Self-direction in learning*. Participants were asked to describe and explain the process they followed during their SDL experience and the challenges they faced.
c. *Impact of ICT on SDL experiences*. Participants were asked to reflect upon the influence that the tools of ICT had on their learning experiences, and to share any suggestions they had for the current design of ICT tools.

Interview sessions were audio recorded contingent upon consent. The recorded sessions were transcribed and translated into English.

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THE EFFECT OF LEARNER AUTONOMY ON MOTOR LEARNING: AN EMPIRICAL STUDY IN DUTCH VOCATIONAL EDUCATION

Arnoud Katz and Wim Westera

This study investigated how student autonomy in physical education can be enhanced without producing adverse effects. A sample of 150 students from Dutch preparatory vocational education was divided into four groups subjected to different levels of autonomy during a physical education lesson. The autonomy conditions varied from teacher-led lessons to student-led task strategy selection, self-monitoring of task execution with video-based self-feedback and self-assessment of performance. Students in the autonomy conditions showed significantly higher motor performance than students in the teacher-led condition. Also, video-based self-feedback led to increased motor learning as compared to video-based teacher-led feedback. Students' self-assessment scores of exercise performance were found to converge very well with the scores assigned by the teachers. Finally, it was established that high performers benefited more from enhanced autonomy than low performers. Motivation was found to be high in all conditions, revealing no significant differences.

Keywords: physical education, autonomy, motor learning, preparatory vocational education, video-based self-feedback

Introduction

Children and young people increasingly suffer from overweight, which is generally attributed to a persistent lack of physical activity (Ness et al., 2007). A recent study across 195 countries revealed that 2.2 billion people, which is 30% of the world population, suffer from overweight and obesity (GBD 2015 Obesity Collaborators, 2017). Both are major risk factors for chronic diseases that include diabetes, cardiovascular diseases, and cancer. The authors of the GBD study have qualified obesity as a "rising pandemic" and a "global public health crisis" (p. 13). Obesity and overweight are readily attributed to a persistent lack of physical activity and other unfavorable lifestyle factors. A most reliable predictor of the future amount of physical activity is the level of education: in the course of their lives, low-educated people show less physical activity than high-educated people (Perlman & Karp, 2010; Pullus, Breedveld, & Van den Dool, 2015). Among all youth in the range of 12-17 years old in

the Netherlands, students from the VMBO schools (lowest level in the Dutch school system) show the least physical activity (De Looze et al., 2014). Although physical education is considered an important instrument for influencing students physical activity levels and preserving these in the long term (Fairclough, Stratton, & Baldwin, 2002), the long-term effects are limited (De Looze et al., 2014).

When it comes to adopting and preserving an active lifestyle throughout one´s life, motivation is a crucial factor (Cox, Smith, & Williams, 2008; Haerens, Kirk, Cardon, De Bourdeaudhuij, & Vansteenkiste, 2010; Taylor, Ntoumanis, Standage, & Spray, 2010). Therefore, efforts of stimulating students' levels of physical activity at school should preferably be grounded in motivational considerations and underlying concepts. In accordance with Ryan and Deci's self-determination theory (Ryan & Deci, 2000), student autonomy has been established as a predominant factor driving student motivation in physical education (Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015). Autonomy in a learning context means students take control of their own learning (Knowles, 1975). Various studies have shown that students who can act more autonomously during physical education lessons are more self-determinedly motivated and more physically active (Cox et al., 2008; Hastie, Rudisill, & Wadsworth, 2013; Haerens et al., 2015; Perlman, 2015). Particularly, nonmotivated students engaged in the autonomy-supportive classes reported significantly higher levels of self-determined motivation (Perlman, 2015).

However, a survey among 1,019 secondary school students in the Netherlands showed that the amount of autonomy is generally low in physical education (Van Ekdom & Van Mossel, 2014). Also, students rarely have a say in the way performances are assessed (Borghouts, Van Dokkum, & Slingerland, 2014). This suggests that current approaches to physical education are largely teacher-controlled thus constraining the opportunities for student autonomy and enhanced motivation. However, a radical turn toward student-led pedagogies may produce adverse effects because an overdose of autonomy (e.g., laissez-faire) is known to likewise affect the efficacy of learning, quality of learning outcomes, and motivation (Wielenga-Meijer, Taris, Wigboldus, & Kompier, 2011). A key question to be answered is how autonomy in physical education can be enhanced without producing such adverse effects. Currently, no empirical data are available about the role of autonomy in physical education at the lowest preparatory vocational education level in the Netherlands. Moreover, most studies in physical education classes focus on motivation only while paying less attention to actual learning outcomes.

Our study focused on motor learning and, in particular, investigated empirically how different levels of autonomy influence students' motor learning outcomes in physical education lessons. Motor learning refers to the processes associated with practice or experience that leads to the acquisition of relatively permanent movement capability. Autonomy in the lessons was varied with respect to goal setting, task strategy selection, monitoring and evaluation of task execution, and the assessment of performance, respectively. Evidence of favorable effects will inform and help teachers and policymakers to procure the use of autonomy-based teaching methods that contribute to better learning outcomes, higher self-determined motivations, and potentially more active lifestyles in the long run.

Theoretical Framework

A variety of theoretical models of motivation have been proposed (e.g., Keller, 2008; Malone & Lepper, 1987; Ryan & Deci, 2000), all distinguishing between extrinsic motivation (referring to performing an activity driven by external factors; e.g., pressure, rewards, or salary) and intrinsic motivation (referring to the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, or to explore and learn). The achievement of sustained behavioral effects is best pursued by stimulating intrinsic motivation. There is abundant empirical evidence that intrinsically motivated students demonstrate more active behaviors during physical education lessons (Aelterman et al., 2012; Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009) as well as outside school (Cox et al., 2008; Haerens et al., 2010; Taylor et al., 2010).

Self-Determination Theory in Physical Education

This study is based on self-determination theory (SDT; Ryan & Deci, 2000). A crucial mechanism described in SDT is the (gradual) transition from extrinsic motivation to intrinsic motivation. This process of internalization (Deci & Ryan, 1985) describes how externally controlled behaviors are gradually adopted and integrated in the subjects' values and interests frames whereby they expose respective behaviors on a more voluntary basis. The principal concepts of SDT include different regulatory styles that cover the range between intrinsic and extrinsic motivation thus describing the progression of the internalization process. The following aggregate labels are commonly used (Ryan & Deci, 2000) to describe these regulatory styles and the associated classes of motivation:

- controlled motivation (emphasising external regulation);
- autonomous motivation (emphasising intrinsic regulation); and
- amotivation (when the subject is not motivated at all).

Autonomous motivation has an essential influence on the patterns of physical behaviors that students display (Cox et al., 2008; Van den Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2014). Autonomously motivated students display better concentration (Ntoumanis, 2005), higher involvement, and higher activity levels in physical education lessons than students demonstrating controlled motivation or amotivation (Aelterman et al., 2012). Since physical activity is more meaningful to autonomously motivated students, higher activity levels are also displayed outside school (Cox et al., 2008; Haerens et al., 2010; Taylor et al., 2010). To get students autonomously motivated, their internalization process of externally-guided behavior regulation should be stimulated. Following SDT, this process can be facilitated by fulfilling the psychologic basic needs of relatedness, competence, and autonomy. Fulfilments of those innate needs would lead to individual growth, a sense of wellbeing, and optimal forms of motivation (Ryan & Deci, 2000).

The Balance between Student Control and Teacher Control

Teachers may help to amplify the autonomous motivation of their students by allowing them some control over their learning activities, which may have a positive influence on motivation and learning outcomes (Cox et al., 2008). However, a cautious balance between teacher control and student control is required to avoid ineffective learning modes such as developing misconceptions, spending too much time on unfavorable activities, or being deprived of feedback (Wielenga-Meijer et al., 2011). Teachers should offer an appropriate guidance structure; students should know what they are expected to do and how they can achieve good learning outcomes (Vansteenkiste, Sierens, Soenens, & Lens, 2007). Without a clear structure with guidelines, expectations, and feedback, the teaching deteriorates to laissez-faire, which is easily associated with limited teacher involvement, unguided exploration, or ultimately chaos and thereby has a negative impact on both motivation and learning outcomes (Jang, Reeve, Ryan, & Kim, 2009; Reeve, 2009). In contrast, full teacher control goes with clear assignments and abundant use of external motivators such as deadlines, rewards, punishments or marks, which may likewise frustrate students' basic psychological needs (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011). Full teacher control may readily lead to controlled motivation (DeMeyer et al., 2014), amotivation, opposition (Haerens et al., 2015), reduced involvement, and reduced learning outcomes (Assor, Kaplan, Kanat-Maymon, & Roth, 2005). Allowing for well-tuned student autonomy would avoid these problems.

Low-achieving students seem to benefit more from enhanced autonomy than high achievers do (Fei-Yin Ng, Kenney-Benson, & Pomerantz, 2004). Low achievers are more sensitive to experiencing successes because of low self-esteem with respect to competences and performances (Pomerantz & Saxon, 2001). Unfortunately, low achievers in the Dutch VMBO schools have been reported to be inherently weak at self-regulation and would still need substantial guidance (Hamstra & Van den Ende, 2006). The level of autonomy offered should match the students' metacognitive skills (Simons & Zuylen, 1995) or self-regulatory skills (Zimmerman, 2002), which include regulatory strategies such as orientation, planning, execution, monitoring, evaluation, and reflection. The low self-regulation ability of low achievers suggests that the degree of autonomy is somehow limited.

Simons and Zuylen (1995) have suggested that the level of student autonomy could be differentiated across different components of the educational process: (a) goal setting, (b) task strategy, (c) monitoring and evaluation of task execution, and (d) the assessment of performance. As students develop their regulative skills, they could be allowed to gradually control more components of the process. The components, which are used in this study to specify different levels of autonomy, are briefly explained below as follows:

- Goal setting. Goal setting in the context of physical education generally means that a motor activity is being set by the teacher for practicing. Nevertheless, giving students choice in selecting the motor activity increases their self-

determination (Prusak, Treasure, Darst, & Pangrazi, 2004; Ward, Wilkinson, Graser, & Prusak, 2008).

- Task strategy selection. The selection of a task strategy in physical education is mainly based on the difficulty of the task. Partial or complete self-control of task difficulty is beneficial for motor learning (Andrieux, Boutin, & Thon, 2016).
- Monitoring and evaluation of task execution. Monitoring and evaluation of task execution through self-recording is also found to be beneficial for motor learning (Chiviakowsky & Wulf, 2005; Kolovelonis, Goudas, & Dermitzaki, 2011). Video-based self-feedback leads to better motor learning (e.g., higher skill progression) than prescribed video-based feedback because it creates deeper awareness and understanding of how a movement needs to be executed (Aiken, Fairbrother, & Post, 2012; Janelle, Kim, & Singer, 1995; Post, Aiken, Laughlin, & Fairbrother, 2016; Ste-Marie, Vertes, Law, & Rymal, 2012).
- Assessment. Assessment in Dutch physical education is usually covered by the teacher (Borghouts et al., 2014). Students generally tend to overrate their performances (Bjork, 1999; Kolovelonis & Goudas, 2012). In particular, at the VMBO level students feel their teacher is an authority who should provide corrective feedback (Groeneveld & Van Steensel, 2009).

Research Questions and Hypotheses

In this study, student groups in physical education were subjected to different levels of autonomy in order to investigate the potential effects on motivation and learning outcomes. Four autonomy levels are controlled by design. All four groups dealt with the same learning activity: the touch somersault, which is a standard flip exercise.

Autonomy conditions of the groups were differed by varying between teacher control and student control across learning task strategy, monitoring and evaluation of task execution, and the assessment of performance, respectively (Simons & Zuylen, 1995). Table 1 displays the four experimental conditions ordered toward ascending student autonomy.

Table 1. *Different Levels of Student Autonomy in Four Experimental Conditions*

Condition	Task strategy selection	Monitoring and evaluation of task execution	Assessment of performance
1	Teacher-controlled	Teacher-controlled	Teacher-controlled
2	Student-controlled	Teacher-controlled	Teacher-controlled
3	Student -controlled	Student-controlled	Teacher-controlled
4	Student-controlled	Student-controlled	Student-controlled

It is expected that giving students more autonomy would positively influence their motor learning (Filak & Sheldon, 2008; Jang et al., 2009). In addition, learners' motivations are expected to act as a mediator between autonomy and learning. Accordingly, research hypotheses are expressed as follows:

- Hypothesis 1: Students in conditions 2, 3, and 4 achieve higher learning outcomes than students in condition 1.
- Hypothesis 2: Students in conditions 3 and 4 will achieve the highest learning outcomes.
- Hypothesis 3: Motivation produces an indirect effect of autonomy on learning.

Method

The experiment uses a between-subjects design with the four conditions; student autonomy is the independent variable, and motor learning and motivation are the dependent variables.

Participants

For this experiment, 166 students from eight classes in IJsselcollege in the Netherlands were invited to participate. Eventually, after having received informed consent, 150 students (63% boys, 37% girls) from both first and second year classes participated. The age range of the sample was 12 to 15 years with a mean of 13.4 years and a standard deviation of 0.6 years. Group composition was arranged through stratification across four initial performance levels and self-regulation skills (see Procedure section).

Instruments

Performance of the touch somersault was measured by observation, supported by rubrics, for each of diverse motoric elements: push off, rotation, and landing. Each of the elements were rated on a 4-point scale. A maximum of 12 points could be achieved based on the task difficulty. With less task difficulty, fewer points could be achieved. The rubrics were developed by the teacher and researcher.

Self-regulating skills were measured with the Self-Regulation of Learning–Self-Report Scale (SRL-SRS; Toering, Elferink-Gemser, Jonker, Van Heuvelen, & Visscher, 2012). This questionnaire uses 46 items for covering planning, self-monitoring, self-evaluation, self-reflection, effort, and self-efficacy. Internal consistency of the items was found to be high for all scales with Cronbach's alphas of 0.81 (planning), 0.84 (self-monitoring), 0.90 (self-evaluation), 0.82 (self-reflection), 0.91 (effort), and 0.89 (self-efficacy).

Motivational regulation was measured with the Behavioural Regulations in Physical Education Questionnaire (BRPEQ; Aelterman et al., 2012), which is a Dutch adaptation of the Behavioural Regulation in Exercise Questionnaire (Markland & Tobin, 2004). It uses 20 items with a 5-point Likert scale to establish 5 motivation subscales: intrinsic regulation and introjected regulation (which combine into

autonomous regulation), external regulation and identified regulation (which combine into controlled regulation), and amotivation. The internal consistency of intrinsic regulation, identified regulation, and amotivation in the sample were found to be high (Cronbach's alpha was 0.91, 0.83, and 0.82, respectively); however, Cronbach's alpha values for introjected regulation and external regulation were low (0.54 and 0.61, respectively) signifying low internal consistency. As a consequence, the use of the overall Relative Autonomy Index (Markland & Tobin, 2004), which is based on all five subscales of the BRPEQ, was abandoned.

Procedure

For the recruitment of participants, the school's management, teachers, students, and their parents were informed about the purpose and setup of the study, the voluntariness of participation, the preservation of anonymity, and what the data would be used for.

To determine the learners' entry levels, they all had to produce five trials of the touch somersault. After the trials, three video recordings of the touch somersault were made. The video recording of the best performance was used for assessment by the teacher and researcher. In all cases the teacher and researcher reached agreement about the assessments. After the video registrations were made, each group received its respective instructions.

Students with all permissions approved, completed the SRL-SRS. The four groups of the study were composed by stratified sampling across three strata of self-regulation skills from the SRL-SRS and four different prior performance classes. In addition, eight students who were graded by their physical education teachers as extremely weak performers and four students who were graded as extremely gifted performers were evenly distributed over the groups to avoid unwanted bias of performances. Variance analysis shows no significant differences between groups with respect to gender, $F(3,146) = 0.19$, $p = 0.904$; age, $F(3,146) = 0.62$, $p = 0.603$; class level, $F(3,146) = 0.05$, $p = 0.985$; motor skills, $F(3, 146) = 0.23$, $p = 0.878$; and self-regulation skills, $F(3, 146) = 0.04$, $p = 0.990$.

In each of the eight classes all four conditions were arranged, requiring four 1.5-hour lessons for each class of four groups: during the lessons, each group spent 15 minutes on their touch somersault session and could practice as much as they wanted while the other groups were playing a sports game. To avoid bias with the sequence order of groups in the classes, a rotational schedule was used to represent all different orders equally.

At the start of the lesson the students were briefed about the research and the setup of the lesson. Prior to exercise all students had to use their iPads to check the instructions about the touch somersault's components and their assessment criteria, explained through videos and texts. During exercise, students in all groups were allowed to consult their iPad at any time they wanted.

In all conditions, five different practice stations were offered to prepare for the touch somersault:

1. a low, declined gymnastic mat;

2. a high, declined gymnastic mat;
3. a low vaulting box with horizontal gymnastic mat on the ground;
4. a medium height vaulting box with gymnastic mat on the ground; and
5. a high vaulting box with gymnastic mat on the ground.

For students in condition 1, the teacher selected the order of practice stations whereas students in conditions 2, 3, and 4 were free to choose the practice stations by themselves (task strategy selection; cf. Table 1).

The monitoring and evaluation of task execution in this experiment was accommodated by a video-feedback application on the iPad. The application allowed for slow-motion playback, annotations, and measurement of relevant posture angles to analyze a movement in detail. In conditions 1 and 2, the teacher provided the video feedback whereas in conditions 3 and 4 students analyzed their movement by themselves. The self-timer function on the application made it possible for the students to use it without the help of others.

A performance retention test of the touch somersault was administered in the fourth (and final) lesson, which was 1 week after the training. During this final lesson students were not allowed to do movement analysis and substantive training. Prior to the assessment, the students did a maximum of five practice jumps as a warmup. Thereafter, they had three trials that were recorded. The video recording of the best performance was used for assessment. After this, students were invited to complete the BRPEQ to record their motivational regulation.

Findings

Effects of Autonomy on Motor Learning (Hypotheses 1 and 2)

The average motor performance level of 150 participants upon start of the experiment was 6.7 (*SD* = 2.1) on a scale from 1 (utterly weak) to 12 (excellent); during the final assessment the motor performance level was found to be 8.5 (*SD* = 1.8). This means there was an average motor learning outcome (viz., performance growth) of 1.8 points (*SD* = 1.5). Table 2 shows the motor learning outcomes per condition.

Table 2. *Mean Performance Growth for Each Condition With Standard Deviations and Effect Sizes*

Condition	Performance growth, *M*	*SD*	*ES*
1	1.4	1.2	1.2
2	1.6	1.2	1.3
3	2.3	1.2	1.9
4	2.1	1.2	1.8

Observed performance growth was different for each condition. All observed effect sizes qualify as very large (Sawilowsky, 2009). The Shapiro-Wilk test for the distribution of these learning outcomes suggested small deviations from normality, indicating skewness of -0.5 ($p < 0.001$) and kurtosis of -0.8 ($p < 0.001$). These deviations were small and hardly observable through visual inspection; therefore, parametric testing was deemed applicable because of its robustness against such minor deviations from normality. An analysis of covariance using motor performance level upon start as a covariate was carried out to test for significant differences of learning outcomes. First, this covariate was found to have a significant effect on motor learning, $F(1,144) = 69.50$, $p < 0.001$. The linear dependency coefficient of $b = -0.42$ indicated that motor learning outcomes are higher when initial motor performance levels are lower. Second, analysis of covariance revealed significant differences of motor learning across conditions, $F(3,144) = 3.79$, $p = 0.012$. Applying Helmert contrasts showed that motor learning in condition 1 was significantly lower than those in the other conditions ($p = 0.014$) thereby supporting hypothesis 1. Likewise, motor learning of participants in condition 2 (moderate level of autonomy) was found to be significantly lower than motor learning in conditions 3 and 4 (high autonomy; $p = 0.025$), which supports hypothesis 2. No significant differences were found between conditions 3 and 4 ($p = 0.646$).

Effects of Autonomy on Motivation (Hypothesis 3)

After removal of six outliers (the value of one of the variables was more than two standard deviations away from the mean), a Shapiro-Wilk normality test showed good normality for controlled motivation ($p = 0.075$) but deviations from normality for autonomous motivation ($p = 0.001$) and amotivation ($p < 0.001$).

Visual inspection showed that deviations from normality were small for both autonomous motivation and controlled motivation, but the distribution of amotivation was found to be highly skewed. Consequently, for amotivation a nonparametric test statistic was used (the Kruskall-Wallis *H* statistic) rather than an *F* statistic.

Table 3 presents the average motivations (averages from the Likert scores of the BRPEQ) for each condition.

Table 3. *Means and Standard Deviations of Autonomous Motivation, Controlled Motivation, and Amotivation for Each Condition*

Condition	Autonomous motivation		Controlled motivation		Amotivation	
	M	*SD*	*M*	*SD*	*M*	*SD*
1	2.6	1.0	1.1	0.6	1.1	1.1
2	2.6	1.0	1.3	0.6	0.9	1.0
3	2.6	0.8	1.2	0.7	1.0	0.9
4	2.7	0.8	1.2	0.5	0.7	0.8

As can be seen from the results in Table 3, the differences between conditions are not significant. This was confirmed by an *F* statistic for autonomous motivation, $F(3,140) = 0.26$, $p = 0.852$, and controlled motivation, $F(3,140) = 1.18$, $p = 0.320$, and an *H* statistic for amotivation (which showed a highly skewed distribution), $H(3) = 3.82$, $p = 0.282$. Thus, no evidence was found to support hypothesis 3.

Discussion

Motor Learning

Significant differences between groups were found for motor learning. Students in the autonomy conditions (2, 3, and 4) showed significantly higher learning outcomes than students in the teacher-led condition. Similarly, significant evidence was found that motor learning by participants correlated positively with the amount of autonomy provided. Students in conditions 3 and 4 (large degrees of autonomy) displayed significantly better motor learning outcomes than students in conditions 1 and 2 (limited autonomy). These outcomes suggest positive impact of learner autonomy on motor learning. Autonomy in task strategy selection and monitoring and evaluation of task execution based on video-based self-feedback led to increased learning outcomes. This agrees with previous studies by Andrieux et al. (2016) and Hartman (2007) that show that freedom of choice in psychomotor exercise improves motor performance. Furthermore, video-based self-feedback is associated with positive effects on motor skills (Aiken et al., 2012; Post et al., 2016; Ste-Marie et al., 2012). In contrast with existing studies that were arranged in a controlled lab situation, our study is ecologically sound in that it took place during regular classroom lessons.

Motivation

In all conditions, the score for autonomous motivation is fairly positive (*M* range of 2.6-2.7 using a 0-4 Likert scale). These positive outcomes might be explained because of the attractiveness of the learning activity (touch somersault) and the use of video instructions (Bund & Wiemeyer, 2004; Tsukazaki, Uehara, Morishita, Ninomiya, & Funase, 2012). The attractiveness of the task may have masked the influence of autonomy. However, no significant differences were found between the groups of learners (cf. Table 3). This means that the role of motivation as a mediator between autonomy and learning (hypothesis 3) was not supported. Several explanations may be considered. Motivation is a complex, multifaceted concept that is inherently difficult to measure accurately (Touré-Tillery & Fishbach, 2014). Indeed, the BRPEQ, even though specifically designed for physical education, displayed some low scale consistencies. Low scale consistencies might be due to limited reading comprehension skills of the participants involved as many of the students at the lowest levels of VMBO evidently suffer from limited reading comprehension and concentration problems (Hamstra & Van den Ende, 2006). Because of this low internal consistency of the instrument, the Relative Autonomy Index (Markland & Tobin, 2004) that indicates

overall motivational states could not be used. For practical reasons, motivation data in this study could be gathered post-practice only thus making a pre-post comparison impossible. Since the BRPEQ was used post-practice and at the very end of the experiment, fatigue or disinterest may have further affected its reliability.

The Role of Video-based Self-feedback and Assessment

Our study demonstrates the positive effect of video-based self-feedback in physical education lessons in a quantitative way. So far, the studies of Aiken et al. (2012), Post et al. (2016), and Ste-Marie et al. (2012) have demonstrated positive effects of video-based self-feedback on motor learning be it in a controlled experiment outside the domain of physical education. Similar results were reported by O'Loughlin, Chróinín, and O'Grady (2013) and Weir and Conner (2009) in the context of physical education be it only as a qualitative inquiry. A quantitative study by Palao, Hastie, Cruz, and Ortega (2015) confirmed the effectiveness of video-feedback be it only for feedback by the teacher, not for the case of self-feedback. It has been suggested that allowing students to do the video analysis themselves (i.e., reviewing their own performances step by step, using slow motion, still frames, rewind, and toggle while consulting the rubric), creates deeper awareness and understanding of the ways they execute or should execute the required moves (Janelle et al., 1995). Also, video-based self-feedback leads to higher levels of self-efficacy because students have control over reviewing successful trials that leads to more confidence about their performance on their upcoming trials (Ste-Marie et al., 2012). Moreover, with the availability of a video-feedback tool, students are more independent and do not need to wait until the teacher helps them. However, studies from Bjork (1999) and Kolovelonis and Goudas (2012) have shown that students are generally weak at correctly self-assessing their physical performances; they tend to systematically overrate themselves. In our study, a comparison of the self-assessments with the teacher judgments shows different situations before and after the training sessions. Prior to the training sessions the average self-assessments were 1.42 points higher than the corresponding teachers' scores (on a 12-point scale) and displayed an acceptable correlation of $r = 0.56$ ($p < 0.001$). This reflects a systematic overrating by students of their performances. After the sessions, student self-judgements and teacher judgements converged very well, showing a reduced difference of only 0.15 points and a strong correlation of 0.95 ($p < 0.001$). This is a relevant additional finding of this study, confirming the effectiveness of using video recordings for self-assessment.

High Performers Versus Low Performers

A secondary analysis of the data shows that high performers benefit more from enhanced autonomy than low performers. After having split the sample at the median score of prior performance, we found that high performers achieve significant learning outcomes, $F(3,84) = 3.68$, $p = 0.015$, while low performers generally do not, $F(3,57) = 0.12$, $p = 0.948$. The Tukey-HSD post hoc test reveals significant differences in motor learning of high performers between conditions 1 and 3 (1.1 points on a 12-point scale,

p = 0.048) and between conditions 1 and 4 (2.2 points, p = 0.023), in favor of more autonomy; the more autonomy offered, the higher the learning outcomes. This observation is in accordance with the study of Cleary and Zimmerman (2001) that showed high performing athletes display better self-regulation skills than low performers and, thus, benefit more from conditions of autonomy (Simons & Zuylen, 1995). These results suggest that physical education teachers should differentiate between low performers and high performers when creating conditions of enhanced autonomy in their lessons.

Self-regulation skills may not be the only factor that explains the difference in motor learning between high performers and low performers when offering more autonomy. Also, the ability of the learner to process the available information to improve upon the skill level might be a crucial factor (Guadagnoli & Lee, 2004). Expert performers will be able to assimilate new information about the movement more efficiently than novices since their motor schemes are well developed (Schmidt, 1975). This is especially the case when video feedback is used. The effectiveness of video feedback depends very much upon the skill level of the performer (Kernodle & Carlton, 1992). Expert performers are able to analyze the movement by themselves, but for novice performers the information needs to be pointed out and supplemented with verbal cues (McCullagh, Ste-Marie, & Law, 2014). This means that for the use of video feedback low-performers may need more tutor-led feedback (teacher control) while high-performers benefit more from self-feedback (student control).

Outlook

The current study has established the positive influence of autonomy and self-regulation on motor learning in physical education lessons; however, a direct link between motivation and learning could not be established. The positive outcomes of using video-based self-feedback and self-assessment in physical education would deserve extensive new research in relation to motivation and motor learning. Also, within the scope of this study, long-term effects could not be taken into account. Once the learning in physical education classes would be optimized, longitudinal studies may be able to demonstrate the persistent influence of physical activity patterns acquired at school throughout one's life and, ultimately, its potential of reducing obesity.

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DESIGNING MOOCS TO FACILITATE PARTICIPANT SELF-DIRECTED LEARNING: AN ANALYSIS OF INSTRUCTOR PERSPECTIVES AND PRACTICES

Meina Zhu and Curtis J. Bonk

This mixed methods study examined instructors' perceptions of self-directed learning (SDL) and the design of MOOCs to facilitate student SDL. Four instructors were selected for Zoom interviews and their MOOCs were reviewed to inform the questionnaire design. An online questionnaire was completed by 48 MOOC instructors worldwide. The findings revealed that MOOC instructors considered SDL skills teachable and creating learning environments to help develop SDL skills possible. In terms of their design and delivery practices to facilitate SDL via a MOOC, the findings suggest that the impact is mainly on learner self-monitoring and motivation. MOOC instructors motivated learners through high quality resources, helping set learning goals, course accessibility, short learning units, providing feedback, meaningful activities, and social learning opportunities. To help student self-monitoring, quizzes, feedback, and self-reflection were used. Strategies recommended to facilitate student management included providing flexibility and support, sending out reminder messages, and suggesting estimated timelines.

Keywords: massive open online courses, MOOCs, self-directed learning, instructional design

Previous research has indicated that self-directed learning (SDL) is integral to adult education (Garrison, 1997; Merriam, 2001). In addition, SDL is also considered critical in MOOCs (Bonk, Lee, Reeves, & Reynolds, 2015; Kop & Fournier, 2011; Terras & Ramsay, 2015). Some MOOC students have exhibited important learning traits such as being self-motivated in learning anywhere and anytime in the world (Jordan, 2014). However, a variety of studies have indicated that learners experience anxiety about SDL and would appreciate instruction and guidance related to SDL at the beginning of courses (Hewitt-Taylor, 2001; Lunyk-Child, Crooks, Ellis, Ofosu, & Rideout, 2001; Prociuk, 1990).

To address this issue, the instructor is expected to act as a facilitator to provide support to ensure that students develop the appropriate SDL skills (Kell & Deursen, 2002; Lunyk-Child et al., 2001). Unfortunately, few studies have examined instructional design challenges in creating a MOOC or the issues that emerge during

the actual delivery of that MOOC from the perspective of MOOC instructors (Margaryan, Bianco, & Littlejohn, 2015; Ross, Sinclair, Knox, Bayne, & Macleod, 2014; Watson et al., 2016); especially lacking is research on instructor perceptions related to facilitating SDL and how they design MOOCs to nurture students' SDL.

The purpose of this sequential mixed-methods study examined instructor perceptions and practices related to their facilitation of SDL in the design and delivery of MOOCs. The findings are intended to inform instructors or instructional designers of MOOC design practices that can facilitate students' SDL.

The following research questions guided this study:

1. How do MOOC instructors perceive students' SDL skills?
2. How do MOOC instructors perceive their facilitation of students' SDL skills?
3. How do instructors design and deliver MOOCs to facilitate students' SDL skills?

Theoretical Perspectives

Self-directed Learning

Since the work of Tough in 1971, concerns for SDL has significantly increased in the field of adult education (Merriam, Caffarella, & Baumgartner, 2007). One popular model is Garrison's (1997) three dimensions model, which defined SDL to include three overlapping aspects: (a) self-management (i.e., task control; focusing on external activities that influence the learning process such as the enactment of learning goals and the management of learning resources and support); (b) self-monitoring (i.e., cognitive responsibility that includes monitoring learning strategies and the ability to think about thinking; both internal processes and external feedback and support are vital); and (c) motivation (i.e., involves both entering and task motivation to initiate and maintain effort toward learning and realizing cognitive goals).

SDL in MOOCs

While the field of MOOCs and open education is relatively young and evolving, studies to date reveal that learners need to be self-motivated and self-directed in MOOCs (Kop & Fournier, 2011; Rohs & Ganz, 2015). Consequently, issues related to SDL have gained much interest in recent years (Bonk et al., 2015).

Key research topics in this field range from obtaining the general ideas for SDL from students' perspectives (Bonk et al., 2015; Loizzo, Ertmer, Watson, & Watson, 2017) to examining the relations between elements of SDL in MOOCs and other forms of open education (Beaven, Codreanu, & Creuzé, 2014; Kop & Fournier, 2011; Terras & Ramsay, 2015). For example, Terras and Ramsay examined MOOCs from a psychological perspective that mentioned some key points related to SDL. They indicated that individual differences in motivation and self-regulation are key learner attributes to consider in the context of learning from MOOCs. For example, Hew and Cheung (2014) revealed four main motivations of MOOC learners: (a)

acquisition of knowledge, (b) curiosity, (c) personal challenge, and (d) the acquisition of qualifications. In addition, Milligan, Margaryan, and Littlejohn (2013) and Beaven, Hauck, Comas-Quinn, Lewis, and de los Arcos (2014) demonstrated that self-regulation is crucial for learning in MOOCs. In particular, research indicated that goal setting and planning can significantly predict students' goal achievement such as earning a course certificate or finishing assessment (Kizilcec, Pérez-Sanagustín, & Maldonado, 2016).

Given that most MOOC learners are adults (Shah, 2017), it is important to note that many researchers have demonstrated that SDL is essential to adult education (Brockett & Hiemstra, 1991; Candy, 1991; Garrison, 1997; Merriam, 2001). In addition, studies have shown that taking personal responsibility, self-direction, and self-discipline are critical factors that impact a learner's success in online classes (Grow, 1991; Schrum & Hong, 2002). SDL is also considered an essential element in MOOCs (Bonk et al., 2015; Kop & Fournier, 2011; Terras & Ramsay, 2015). As the number of universities that are offering MOOCs is rapidly expanding (Shah, 2015, 2019) and most studies continue to focus on students' motivation and completion rates (Zhu, Sari, & Lee, 2018), scant research directly investigates the design of MOOCs to facilitate SDL from the instructor's perspective. In response, this study will examine instructor perceptions and practices related to their facilitation of SDL in the design of MOOCs.

Method

This study utilized a sequential mixed methods design (Creswell & Plano-Clark, 2017; Fraenkel & Wallen, 2009) consisting of two phases: qualitative followed by quantitative (Creswell & Plano-Clark, 2017). The primary data sources of this study included (a) in-depth interviews with four instructors who volunteered to participate; (b) detailed course review of the MOOCs taught or designed by the four interviewees; and (c) an online questionnaire sent in July 2018 to 492 MOOC instructors worldwide via SurveyMonkey with 48 valid responses. The researchers validated and cross-checked the findings using different data sources (Patton, 1990). This approach provided a more nuanced understanding of instructors' perceptions of designing and delivering MOOCs for SDL than relying solely on one data source (Baxter & Babbie, 2003).

Data Collection

Interview. To help design the questionnaire and obtain initial ideas about MOOC instructors' perceptions of SDL in MOOCs and their facilitation of SDL in MOOCs, an interview protocol with 12 questions was developed based on the prevailing research literature and expert feedback. The experts we consulted included one mixed-method expert, one design expert, and one MOOC research expert. For instance, they recommended to include questions about MOOC instructors' background such as their online or MOOC design experiences to better understand their instructional design and pedagogical approaches. The final 12

interview protocol items included questions on participant background information (four questions), their perceptions of students' SDL skills (three questions), their facilitation of SDL (four questions), and their professional development needs (one question). Semistructured interviews were conducted with four MOOC instructors via an online conference tool, Zoom.

The primary selection criteria for recruiting MOOC interviewees were (a) the instructors should have prior experience in designing and teaching a MOOC and (b) the instructors' MOOC should be delivered in English. The four interviewees represented four different subject areas and three different countries and MOOC providers. Selecting interviewees from diverse countries, subjects, and MOOC providers can potentially result in more comprehensive ideas. For example, the technology functions, features, and affordances of the platforms provided by different MOOC providers might influence instructors' instructional design and delivery decisions regarding SDL.

As indicated, diversity was sought when conducting the interviews. Two interview participants were from the United Kingdom (1 female, 1 male); one from the United States (female), and one from Canada (male; see Table 1). The interviewees taught different subjects: literacy, computer science, economics, and biology. The MOOC platforms of these four courses were Coursera (two MOOCs), FutureLearn, and Kadenze. The interviews were audio recorded. Each interview lasted approximately 30-50 minutes. The in-depth semistructured interviews enabled us to obtain MOOC instructors' perceptions of SDL in MOOCs and the strategies for facilitating SDL in MOOC design and delivery, which further informed the design of the questionnaire.

Table 1. *Interviewees' Demographic Information*

Country	Subject area	Platform	Gender
UK	Language and Literacy	FutureLearn	Male
UK	Computer Science	Kandenze	Female
US	Business	Coursera	Female
Canada	Geography	Coursera	Male

Document analysis. The documents were components of the MOOCs designed or taught by the interviewees. In order to triangulate the interview data, the primary researcher reviewed the four interviewees' MOOCs both before and after the interview.

Web-based questionnaire. The questionnaire was adapted from an instrument developed by Fisher and King (2010) and Williamson (2007) to measure student SDL based on the conceptual framework of Garrison (1997). In addition, we used the interview findings to revise the questionnaire items. For instance, based on the interview data analysis related to strategies that MOOC instructors used to facilitate SDL, we further revised the questions in the questionnaire such as help students with self-management skills (e.g., time management). The final questionnaire contained a total of 29 questions, including twenty 5-point Likert scale questions, three closed-ended questions about their perceptions of SDL in MOOCs, and six questions about demographic information of the participants. Self-management, self-monitoring, and motivation scales were composed of six, seven, and seven questions, respectively.

To test the internal reliability of the questionnaire, Cronbach's alpha was computed using SPSS. The Cronbach's alphas for the entire questionnaire as well as the self-management, self-monitoring, and motivation items were 0.79, 0.71, 0.76, and 0.65, respectively. The three closed-ended questions are multiple choice questions: (a) whether they considered students' SDL when designing or delivering MOOCs (yes or no questions); (b) their perceptions of SDL with three options (i.e., SDL is students' learning personal attributes that can never be changed, SDL is students' learning personal attributes that can be changed, and SDL is a set of skills that can be educated); and (c) their perceptions of facilitating students' SDL with three options (i.e., instructors can do nothing for students' SDL skills, instructors can unintentionally create a learning environment that encourages SDL skills, and instructors can intentionally create a learning environment to help develop SDL skills).

Data Analysis

Classical content analysis was employed to analyze interview data. Interview recordings were transcribed verbatim for coding immediately after the interview. The recordings were stored in Kaltura for mechanical transcription. Then, the primary researcher reviewed the transcriptions again to check the accuracy. To promote validity, first-level member checking was employed. As such, the transcripts were sent back to the interviewees for a member check to ensure the accuracy of the transcripts while also soliciting supplemental opinions.

After member checking, classical content analyses were conducted abductively by the primary researcher (Leech & Onwuegbuzie, 2007). In this study, the unit of analysis was the meaning unit. To perform an abductive content analysis, the researcher had a general SDL model and research questions in her mind. Next, she read through the entire set of data. Third, the researcher chunked the data into smaller meaningful parts. The fourth step, as recommended by Haney, Russell, Gulek, and Fierros (1998), required the researcher to label each chunk with a code and compare each new chunk of data with previous descriptions; any similar chunks were labeled with the same code. After all the data had been coded, the codes were grouped by similarity to identify themes. The main themes that emerged from the data are as follows: (a) perceptions of students' SDL, (b) perceptions of their facilitation of SDL, and (c) strategies to support

SDL in the design and delivery of MOOCs regarding motivation, self-monitoring, and self-management.

Descriptive statistics embedded in SurveyMonkey, SPSS, and Excel were used for questionnaire data analysis. The questionnaire used a 5-point Likert scale to measure instructor's perceptions of SDL in MOOCs.

The quantitative data analysis and qualitative findings from interview and MOOC reviews were integrated through joint display as detailed in the Findings session.

Contextual and Demographic Information of the Survey Participants

We sent the questionnaire to 492 MOOC instructors' email. Twenty-eight instructors opted out; 11 individuals completed the questionnaire partially; 185 did not open the survey; 220 declined the survey. As a result, 48 participants (10% response rate) fully completed the questionnaire. These who fully completed the questionnaire (n = 48) were from diverse subject backgrounds; i.e., language and literacy, business, medicine and health, and art. Their online instructional design experience varied. Instructors (n = 48) ranked on a scale of 1 (*Strongly disagree*) to 5 (*Strongly agree*) whether they had many experiences related to designing fully online or blended courses prior to designing their MOOCs. Among the 48 participants, 21 participants (44%) had no fully online or blended course design and teaching experience prior to designing a MOOC (see Figure 1). Only 29% of the survey participants (n = 14) had designed more than two fully online or blended courses. However, 25% of the participants (n = 12) had designed five or more fully online or blended courses prior to designing a MOOC. Clearly, there was a wide range of previous fully online or blended experience among the study participants.

In terms of specific MOOC design and teaching experience, 58% participants (n = 28) had designed or taught only one MOOC (see Figure 2). On the other hand, 10% of the survey participants (n = 5) had previously designed or taught five or more MOOCs. Overall, most MOOC instructors did not have extensive MOOC design experience.

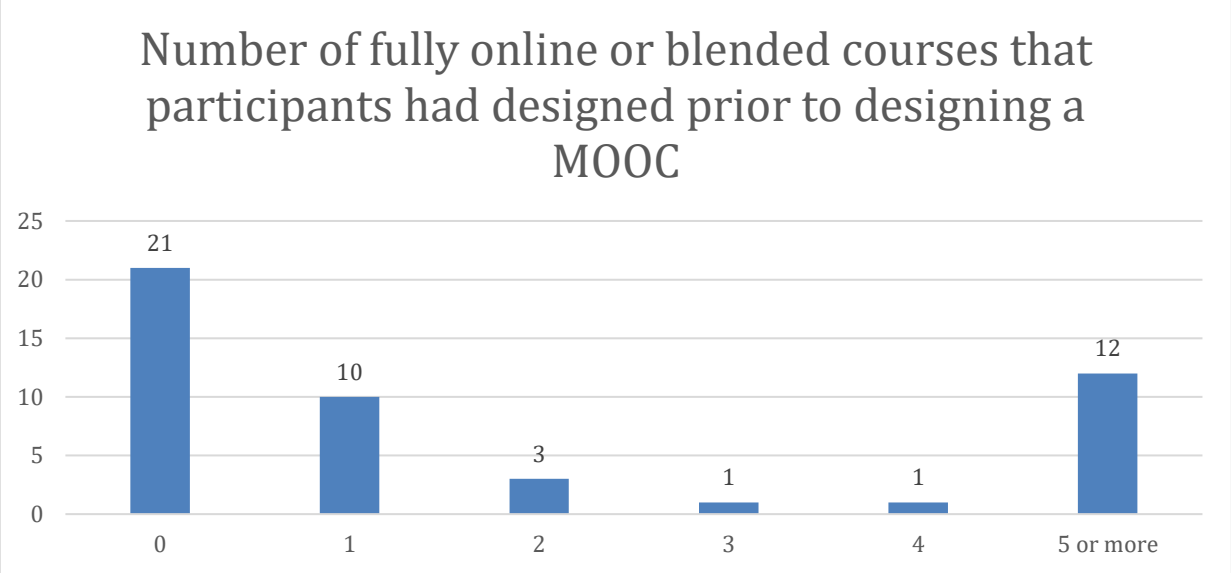

Figure 1. Fully online or blended courses previously designed or taught by survey participants (*n* = 48).

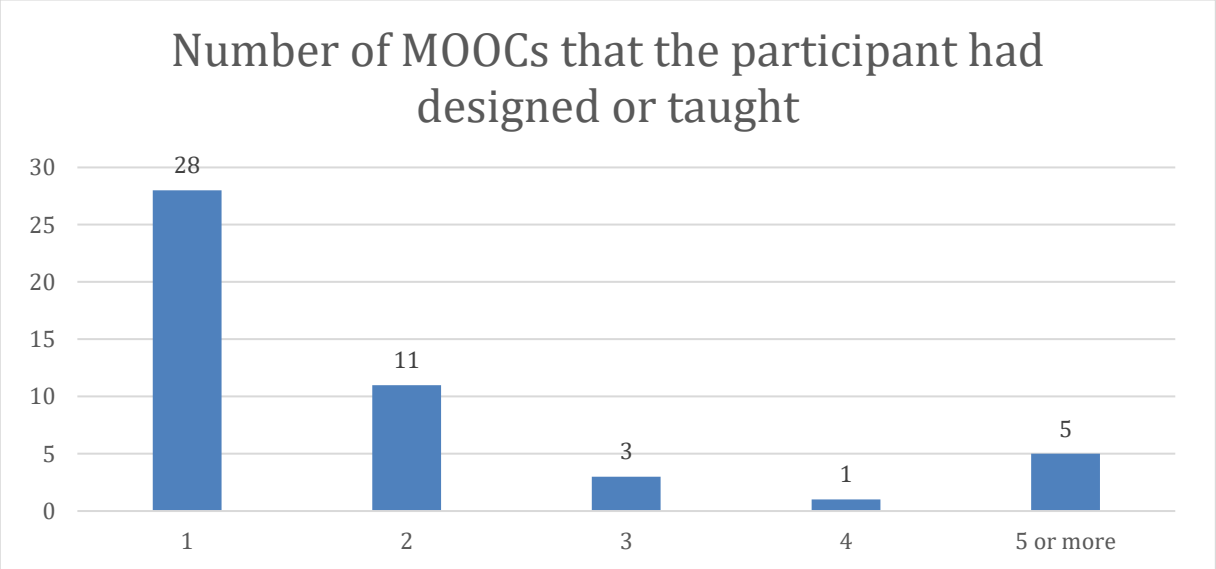

Figure 2. The number of MOOCs that the survey participants had designed or taught (*n* = 48).

In general, the number of enrolled students in respondents' MOOCs widely varied (see Figure 3). For instance, 44% of respondent MOOCs (*n* = 21) had more than

15,000 students. Almost 60% of their MOOCs (*n* = 28) had more than 10,001 students. In addition, 6 out of 48 (13%) of respondents' MOOCs had less than 1,000 students.

In terms of the MOOC format, more than one-third of the MOOCs (*n* = 18) were self-paced, followed by instructor-led with teaching assistant support (*n* = 16), and instructors that had no such support (*n* = 8; see Figure 4).

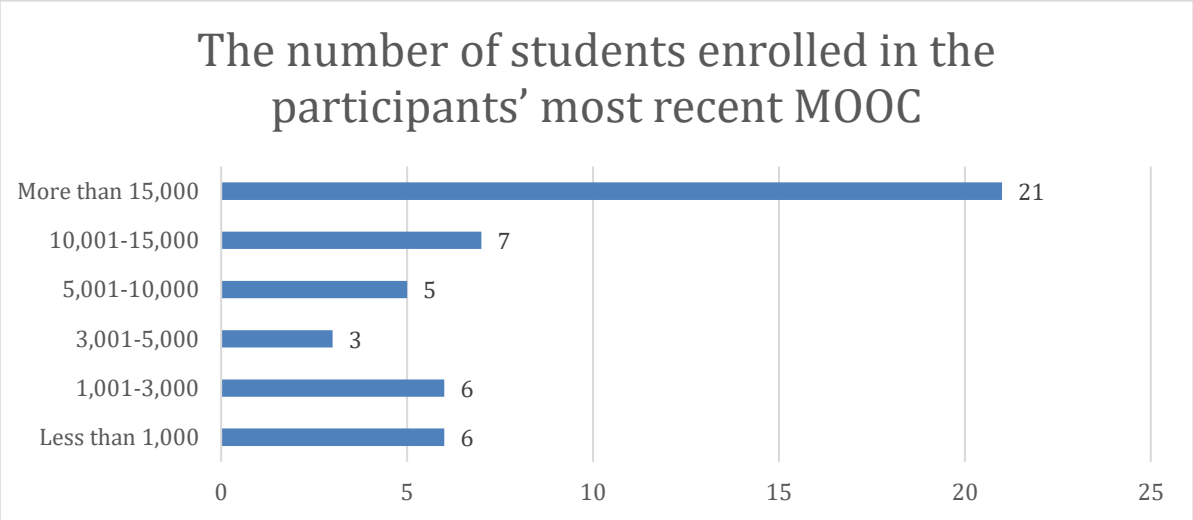

Figure 3. The number of students enrolled in the survey participants' most recent MOOC (*n* = 48).

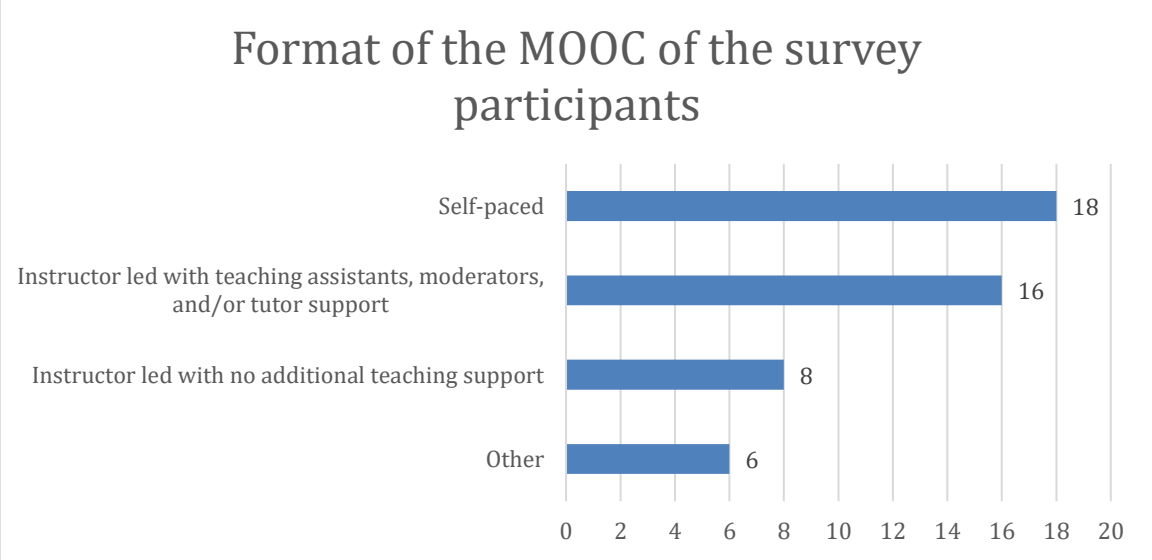

Figure 4. The delivery format of most recent MOOC (*n* = 48).

Three out of four MOOC instructors noted that attempts at innovation in teaching and learning such as trying out new teaching strategies and increasing student access to higher education worldwide were key motivators for offering MOOCs (75%, *n* = 36). These answers were followed by building one's institutional reputation (63%, *n* = 30) and experiencing teaching and connecting to a large audience (60%, *n* = 29; see Figure 5). Only one participant was motivated by the possibility of obtaining a tenure track position.

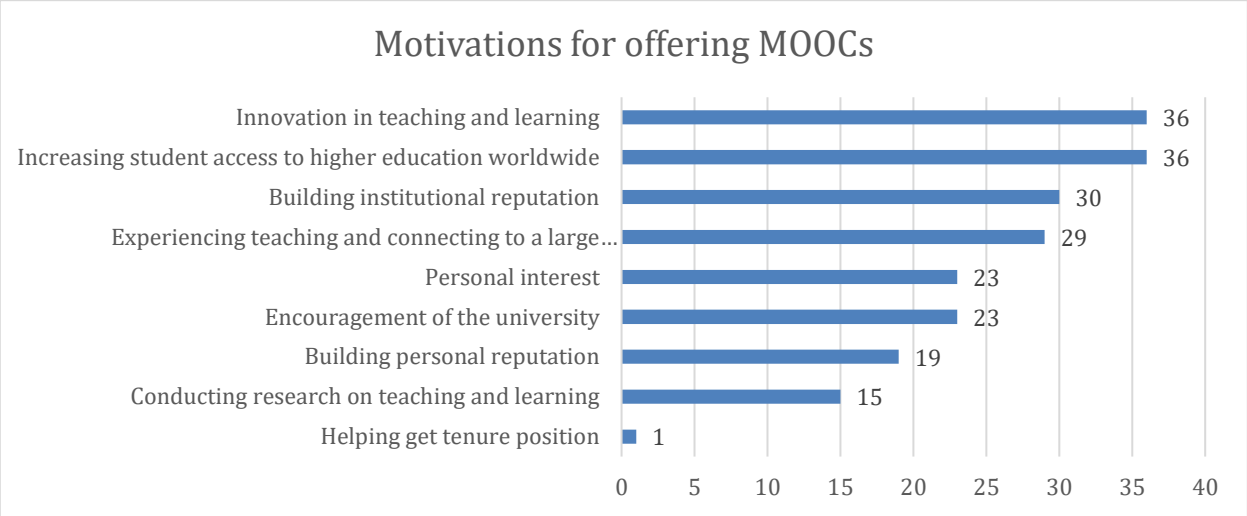

Figure 5. Motivations of survey participants for offering MOOCs (*n* = 48).

Findings

Research Question (RQ) 1. How do MOOC Instructors Perceive Participants' SDL Skills?

In response to the question "Have you ever taken students' self-directed learning into consideration when designing or delivering MOOCs?" seventy percent of the participants reported that they had. In addition, 52% of the participants (*n* = 25) reported that they perceived SDL as a set of skills that can be educated (see Figure 6). Forty percent of instructors (*n* = 19) considered SDL to be related to personal attributes of students that can be developed. However, none of the respondents believed that personal attributes related to SDL were unchangeable.

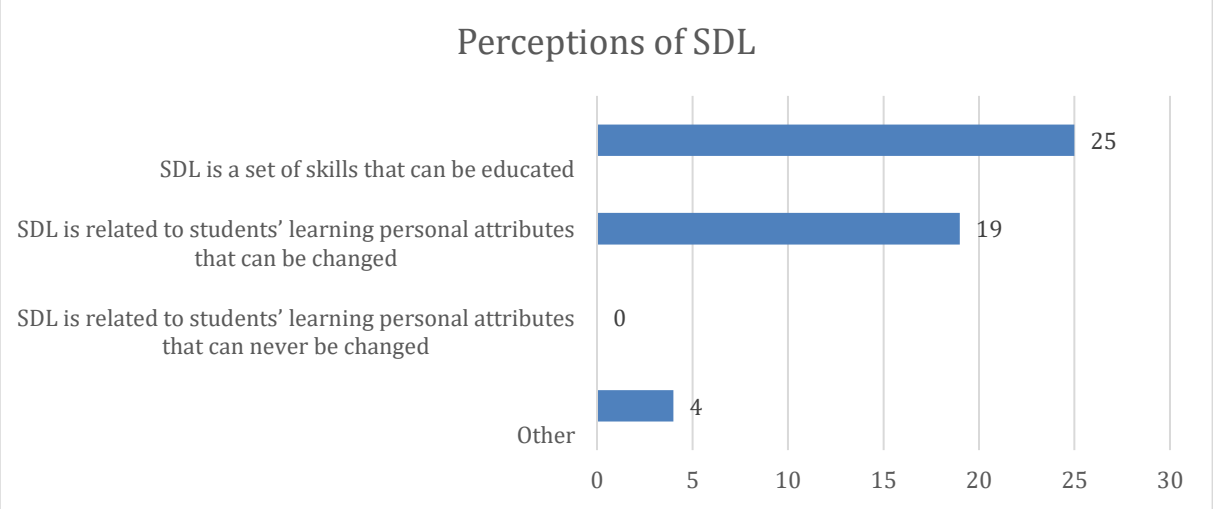

Figure 6. Survey participants' perceptions of SDL (*n* = 48).

From the interview, the MOOC instructors expressed their perceptions of participant SDL skills. For example, an instructor from the UK shared an example of students who had demonstrated high SDL.

> I guess to me it gets really exciting to look at how a number of those students have done projects that really go beyond the simple examples that I showed in lecture, and beyond the simple things they were asked to do in the assignments. You know they've taken them into the real world.… One student who during the presidential election made a presidential debate voiced motion classifier that you could run. And it would tell you whether candidates were being angry or not. It was just like really fun stuff that people did.

RQ 2. How do MOOC Instructors Perceive Their Facilitation of Participants' SDL Skills?

In general, MOOC instructors whom we surveyed reported that they could play a key role in facilitating participants' SDL skills. In fact, 92% of participants (*n* = 44) reported that instructors can intentionally create a learning environment to help develop SDL skills (see Figure 7). Six percent of the questionnaire participants (*n* = 3) reported that instructors can unintentionally create a learning environment that encourages SDL skills and 2% (*n* = 1) of participants selected other. No one believed that nothing could be done.

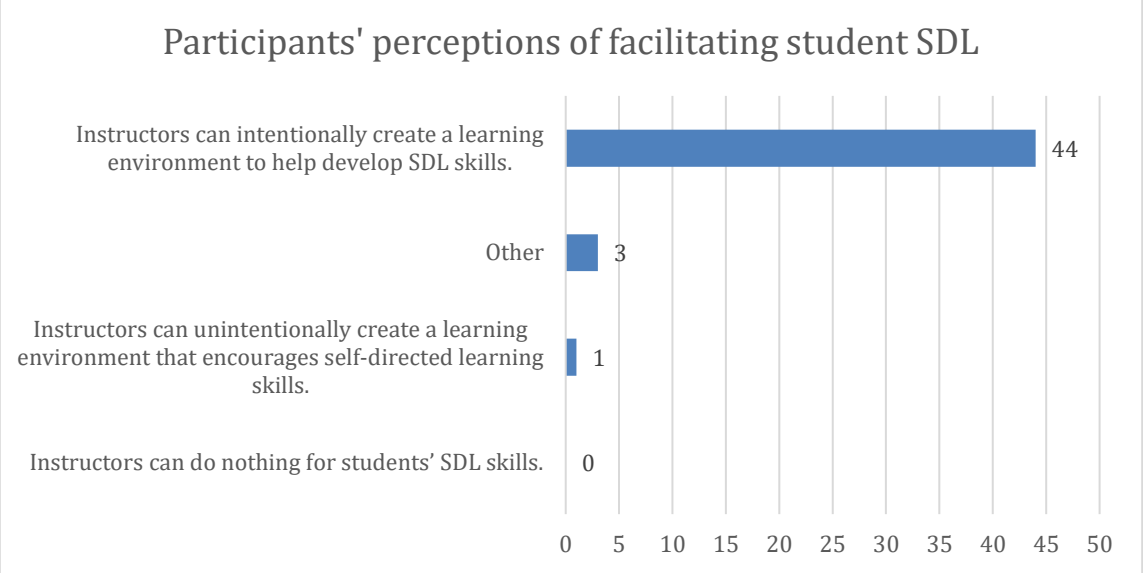

Figure 7. Survey participants' perceptions of their role in facilitating SDL skills (n = 48).

The questionnaire findings concurred with interview findings that MOOC instructors can facilitate SDL. When responding to questions about MOOC instructor responsibility of facilitating SDL, one instructor from the UK stated, "I mean instructors can absolutely help, and, furthermore, I think [it was] the architecture of the MOOC itself that really helped." Even though MOOC instructors considered that they had the responsibility of helping student SDL, they admitted that their effort was limited. One Canadian instructor shared this opinion:

> Yeah. I tried. But I also think it's probably their responsibility to be motivated. So, I just make myself available and encourage people to complete the course if they get stuck on something to ask questions or to move on.

RQ 3. How do Instructors Design and Deliver MOOCs to Facilitate Participant SDL Skills?

MOOC instructors responding to our questionnaire (n = 48) ranked on a scale of 1 (*Strongly disagree*) to 5 (*Strongly agree*) whether the design and delivery of their MOOC helps the students to develop SDL skills in detail. The mode of most of the items was 4 (agree), except the fourth item which had a mode of 3 (neither agree nor disagree). The top five SDL skills that their MOOCs facilitated included (a) motivates students to learn new information (M = 4.37); (b) helps the student critically evaluate new ideas (M = 4.15); (c) helps the student be in control of his/her learning (M = 4.15); (d) helps the student be responsible for his/her learning (M = 4.06); and (e) helps the student to be able to find out information related to learning content for him/herself (M

= 4.02; see Table 1). However, it seems that instructor MOOC designs have limited influence on students' management skills (e.g., managing time and learning resources; *M* = 3.37) and setting strict time frames for learning (*M* = 3.21).

Table 1. *Mean Score and Standard Deviation of the Specific SDL Skill that the Survey Participants' MOOC Facilitate*

Items	*M*	*SD*
1. helps the student be self-disciplined	3.71	0.82
2. helps the student be organized	3.71	0.74
3. helps the student set strict time frames for learning	3.21	1.03
4. helps the student have good management skills (e.g., managing time and learning resources)	3.37	0.79
5. helps the student prioritize his/her study (e.g., determine the order in which the studies are to be done)	3.60	0.82
6. helps the student be confident in his/her ability to search out information	3.85	0.68
7. motivates students to learn new information	4.37	0.64
8. helps the student develop a need to learn	3.90	0.69
9. helps the student embrace a learning challenge	4.00	0.65
10. helps the student critically evaluate new ideas	4.15	0.74
11. helps the student learn from his/her mistakes	3.79	0.77
12. helps the student to seek the deeper reasons of the facts	3.85	0.71
13. helps the student be willing to seek different ways to solve difficult problems	3.77	0.69
14. helps the student be in control of his/her learning	4.15	0.55
15. helps the student set his/her own learning goals	3.68	0.91
16. helps the student evaluate his/her own performance	3.94	0.78
17. helps the student be responsible for his/her learning	4.06	0.79
18. helps the student be able to focus on a problem	3.87	0.74
19. helps the student be able to find out information related to learning content for him/herself	4.02	0.70
20. helps the student have high beliefs in his/her abilities of learning	3.73	0.74

In the interview, the specific strategies MOOC instructors used in their design and delivery in terms of facilitating student SDL were revealed. The MOOC content, activity, and other open documents of these four instructors were reviewed to triangulate the interview data. As displayed in Table 2, 13 themes emerged in the interviews and content reviews.

Table 2. *Strategies to Facilitate MOOC Participants' SDL Skills*

Category	Subcategory	Strategies
Motivation	Course content accessibility	Our course is accessible and we make them think.
	High quality resources	We knew we had good resources, images, good film footage. We wanted something that is attractive.
	Instructor feedback	What I do is I just go on [the LMS] every day and try to answer questions and engage with people. The MOOCs we reviewed showed that instructors provided feedback in the discussion forum. [MOOC review]
	Learning goals	I think it is it is helpful in what we try to work through the course for if students can think to the future [goals]. That would be one of the self-directed skills that I think would help them. The MOOC instructors asked students to share their learning goals with classmates. [MOOC review]
	Meaningful learning	The topic is personal finance. And I think that is reasonably self-motivating in the sense that it is something that is very applicable to most people's lives.
	Short learning units	I think [a] common practice now, for instance, is to chop up video in a ten-minute chunk so that it's really easy for students to watch a little bit at a time, to watch it on the go…that can make it really easy for students

		to engage.
	Social learning community	We have people to create an image [or] a picture of their financial goals and then to put it out with hashtags on either like Twitter or Facebook or Instagram and share it with other people in the class.
Self-monitoring	Automated feedback system	It's my hope that the automated feedback system gives them enough useful information that they feel like they're getting something out of doing the assignments. The course provided automated feedback to learners once they answered the questions in quizzes. [MOOC review]
	Quizzes and other assessments	We had quite simple quizzes at the beginning and then [they] became slightly more difficult. Also with most of the materials, we try to deepen their thinking as time [goes] by. The course provided quizzes for self-assessment in each video. [MOOC review]
	Reflection	One of the things that I tried to do was give people opportunities for different types of engagement with explicit opportunities for reflection built-in.
Self-management	Flexibility and support	We've actually changed it a bit over time to try to find the right level of flexibility and support. The MOOC platform allowed learners to move to the new sessions with new timelines if they miss the previous timeline. [MOOC review]
	Reminding message	We have reading lists and I update the reading lists for the course on a regular basis. We have a mailing list we can use. I remind people to look at that and update it.
	Suggested timelines	There's sort of a suggested timeline for you. The MOOC platform provided suggested timeline on the first page. [MOOC review]

Motivation. To motivate students in courses, MOOC instructors relied on several strategies and tactics. For instance, they used high quality resources, helped students set learning goals, made their course accessible to learners, used short learning units, and provided different forms of feedback. They also made attempts to offer meaningful activities and social learning opportunities that might better engage their MOOC participants. For example, as noted in the quote below, one instructor from the US engaged her students by providing a social learning community:

> We did try to really think about how we could get people involved. We really tried to build that discussion questions so that for everyone if you're taking the course and really trying to get credit for it like, the certificate, then you have to reply to other people's forum in order to keep progressing through the course. You can't just post your own. So, we're really trying to encourage people to engage with each other during the course. Thinking that building community might help people stay engaged.

A professor from the UK highlighted how he facilitated SDL skills by engaging students and making them accessible. As he described,

> We knew we had good resources, images, and good film footage…We worked really hard to make the point of entry as wide as possible. And it has shown from the enrollment of 17,000 people. So our course is accessible and we make them think.

Another professor from the UK made the learning meaningful to motivate student learning. She observed that "for student motivation it was really important to me to make it very clear how all the concepts we were talking about could be applied in projects that they cared about." In effect, she was attempting to connect the content of her MOOC to a wide gamut of personal experiences, backgrounds, and expectations.

Self-monitoring. As might be expected, there are myriad approaches for fostering SDL skills. To help student self-monitoring, these MOOC instructors tended to rely on quizzes as well as different forms of feedback and self-reflection. For instance, an interview with one instructor from Canada revealed a more behaviorally-based tactic that some MOOC instructors use to facilitate student SDL skills. He argued, "I think our quizzes at the end are helpful… We have reading lists and I update the reading lists for the course on a regular basis." He added that they "direct people to that" and send reminders through the forum and emails.

Self-management. Last but not least, MOOC instructors facilitated student management by providing flexibility and support, sending out reminding messages, and suggesting estimated timelines. For instance, one professor from the UK stated,

> And there's, sort of, a suggested timeline for you. If you don't submit something by a deadline, you're not going to be analyzed. You know you just could submit

> it all [on] the last day all at once and still get the same feedback and get the same grade. But also, the grade doesn't actually mean anything, because…it's not for credit.

Limitations of the Study

There are several notable limitations of this study. First, the instructor names, institutions, contact information, and courses were collected from several key MOOC vendor websites including Coursera, FutureLearn, and edX, while skipping those not in English like XuetangX. In addition, respondents' completion rate, while acceptable for an opt-in questionnaire (Cho & LaRose, 1999), was just 10%. Third, the four MOOC interviewees in this study were the ones who self-reported a strong affinity towards SDL. Given that the questionnaire and interview data were self-reported, the data collected relied on the MOOC instructors' truthfulness in responding to the questions. Finally, we could not verify whether the strategies that MOOC instructors reported were effective or not.

Discussion and Significance of this Study

This study explored instructors' perceptions of SDL and the design of MOOCs to facilitate learners' SDL. The goal was to inform instructors as well as instructional designers of the effective practices for designing MOOCs to facilitate students' SDL. In confirming Garrison's (1997) SDL model, the findings of this study indicated that MOOC instructors considered that SDL was related to motivation, self-monitoring, and self-management. Notably, MOOC instructors acknowledged the importance of SDL skills in MOOC learning.

Among the diverse SDL skills and competencies, MOOC instructors emphasized student motivation most. They reported that students should have a basic level of SDL skills or attributes whether they were operating in a MOOC or some other type of educational environment. However, a majority of the MOOC instructors reported that these skills or attributes were not static. In effect, study participants most often viewed SDL as a set of skills that could be educated or students' personal attributes that could be changed. Stated another way, they were optimistic about learners' ability to acquire or enhance their SDL skills and repertoire.

The findings of this study support the findings from previous studies which found that SDL is an essential and important element for students in MOOCs (Bonk et al., 2015; Kop & Fournier, 2011; Terras & Ramsay, 2015). In addition, self-motivation is one of the most important attributes or skills in MOOCs reported by MOOC instructors, which supports the findings from Kop and Fournier and Rohs and Ganz (2015). This study found that MOOC instructors consider SDL as basic attributes and skills needed to succeed in a massively open online course or any course for that matter; such findings align well with many adult education scholars' perspectives of SDL (Brockett & Hiemstra, 1991; Brookfield, 2013; Candy, 1991; Garrison, 1997; Merriam, 2001).

In accordance with Guglielmino's (1977) suggestion that SDL awareness and practice is vital to their enhancement, the present study found that a majority of MOOC instructors feel that SDL skills or attributes can be enhanced or educated. These findings also support what Kell and Deursen (2002) suggested that most MOOC instructors feel that they can intentionally create learning environments that foster the development of SDL skills. Clearly, such a view supports the idea that instructors can effectively support students to develop SDL skills (Kell & Deursen, 2002; Lunyk-Child et al., 2001).

In terms of their design and delivery practices to facilitate SDL via the MOOC, it seems that the impact is mainly on learner self-monitoring and motivation. Such findings are aligned with the findings of Barba, Kennedy, and Ainley's (2016) study that showed a positive relationship between learner motivation, participation, and performance in MOOCs. Along these same lines, Howe (1987) argued that motivation influences cognitive aspects of learning. Of course, feedback is a vital component in positively influencing student performance (Collis & Margaryan, 2005). It is incumbent, therefore, for MOOC instructors and the entire instructional design team to find ways to lend feedback to MOOC participants whether it is from other humans, the course management system, or other embedded technology tools and applications. Nevertheless, as Watson et al. (2016) noted, since it is impossible for instructors to provide direct or immediate feedback on thousands of submitted assignments, MOOC learners are often demotivated. In this study, MOOC instructors revealed that instructor feedback and automated feedback are crucial for motivating students and fostering student self-monitoring.

To foster students' self-monitoring, MOOC instructors in the present study provided quizzes for self-assessment and reflection opportunities. MOOC instructors reported that self-assessment gave their participants a chance to review their work and monitor their learning process. Such findings align with the findings of Kulkarni et al. (2013). Other scholars have claimed that self-assessment helps students reflect on their learning and achievement (Pintrich & Zusho, 2002; Zimmerman & Schunk, 2001) and offers students a learning opportunity that they cannot easily obtain from external feedback (Dow, Kulkarni, Klemmer, & Hartmann, 2012).

For facilitating self-management, particularly time management, MOOC instructors in this study reported that they provided estimated time frames. Time management refers to students scheduling and managing their study time (Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Kloos, & Fernández-Panadero, 2017). Unfortunately, students who have low time management skills tend to have higher possibilities for dropping out from MOOCs (Nawrot & Doucet 2014; Zheng, Rosson, Shih, & Carroll, 2015). On the other hand, studies have indicated that students who complete a MOOC demonstrate high time management skills, which further verifies that time management is one of the most effective SDL skills (Kizilcec et al., 2016).

Conclusions

As evident, this research begins to fill a critical gap in the MOOC literature by exploring instructor perceptions and practices related to student SDL. It did this through

triangulating MOOC instructor questionnaire data with interviews of four MOOC instructors and content analyses of their courses for evidence of SDL approaches and strategies. Better understanding of MOOC-related SDL skills and competencies as well as associated instructional components and approaches to encourage MOOC learner SDL should result in higher completion rates. It conceivably could also result in greater governmental or institutional reliance on MOOCs as a viable educational delivery platform and, therefore, be a key part of a country's strategic planning and overall economic engine.

We are currently in the midst of expanding the present research study with additional MOOC instructor participants in the hope that it will further inform the design of more effective and engaging MOOCs. We are also currently interviewing MOOC learners about their SDL needs and experiences. When combined, insights from MOOC instructors and MOOC learning participants should foster an understanding of SDL processes and instructional possibilities that can lead more learners to success not just with respect to MOOCs but with every learning setting in which they might participate be it physical, digital, or some novel mixed approach.

In the end, this study offers several important and evolving insights into MOOC design for SDL. The findings provide implications for instructors as well as instructional designers concerning the design of MOOCs for self-directed learners. The online questionnaires, interviews, and document reviews were just the first steps in the process. It is now incumbent on additional MOOC researchers to join our efforts in determining how, when, and in what specific ways to foster SDL in MOOCs. The world community is waiting.

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