

Improve Interactivity in Online Learning: Take Nearpod as an Example

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Abstract. Online learning is gradually taking the place of traditional teaching and training on some occasions, and how effective interaction can be ensured in an online learning environment through pedagogical design without face-to-face communication has become a topic that is expected to be studied. The importance of interactivity in learning is admitted but there is not adequate emphasis academically and pedagogically. Therefore, this research is based on the discussion of the definition, the technological tools, and the effects of online interactive learning to propose suggestions for optimizing the implementation of this learning mode. Learners' interaction with peers and learning materials are two forms of interaction that are studied in this article. These two kinds of interaction can contribute to effective peer communication, the development of critical thinking, and the support for individualized learning. To improve effectiveness, many factors of collaborative learning, multiple forms of pedagogical feedback, and the encouragement of learners' manipulation of information should be considered in learner-learner interaction. Concerning learner-content interaction, the instructor should carefully arrange learning materials and design materials for individualized learning. Therefore, an interactive online lesson is designed by using functions in Nearpod, which is a convergence of interactive tools.

Keywords: Online interactive learning; Learner-learner interaction; Learner-content interaction.

1. Introduction

The integration of online technology tools into learning is necessary for individuals to cope with the ever-changing modern society. With support from educational technologies, learners can have transformative learning experiences compared with those in conventional classrooms, which can also facilitate human welfare if utilized appropriately.

Compared with traditional instructional environments, online learning communities provide a brand-new way of dissemination of knowledge, which includes much more amount of information, way higher speed of dissemination, multiple forms of information carriers, up-to-date content, more empowerment to learners, less temporal restriction to interaction, less communicative barrier caused by distance and so on. Further, from a pedagogical perspective, information and communication technologies provide an easier way to manipulate information, conduct interdisciplinary design, and offer learners deeper interaction with learning content than conventional textbooks, slides, and lectures [1], which can benefit learning considerably.

Economically, the development of information technology can be an effective way to reduce costs in education, and when technology integration is widely and smartly applied in education, teaching and training can be more cost-effective and equally accessible [2]. Therefore, from this perspective, the integration of information and communication technologies can improve social equality in the field of education.

There is concern that online learning might be of low quality and dehumanized due to the absence of face-to-face interaction. However, many researchers have reported that the integration of online learning is not less effective than learning in a face-to-face classroom [3]. Therefore, how to improve the effectiveness of online learning by optimizing pedagogical design should be carefully studied.

One possible approach is to develop an interactive online learning environment. Online learning is characterized by interactivity, and interactive forms such as user-technology interaction, user-information interaction, and user-user interaction widely exist in the daily use of web-based learning

communities. In practice, interactive learning as a significant approach to facilitate the effectiveness of learning activities is a concept that might be forgotten in most cases, and less interactive methods such as lectures, mere watching of videos, and PowerPoint slides are frequently chosen.

Therefore, this article aims to discuss interactive online learning, which combines interactivity and web-based information and communication technologies, to provide more evidence for facilitating effective online learning environments, cost-effective learning and training modes, accessibility to high-quality education, and social educational equality.

2. The Background of Online Interactive Learning

2.1 Definition of Online Interactive Learning

Interactivity in the online learning environment can be defined as mutual and continuous communication of different participants in teaching and learning to perform learning tasks [4]. Based on the research of Damnik et al. [5], an interactive computer-based learning environment should be considered from three aspects, which are technical, mental, and social dimensions. Therefore, online interactive learning includes interaction between technological tools and students, cognitive interaction between participants, and social communication between peers. It is also pointed out that interactive learning can be defined variously in an online learning context: a) interactive learning materials, such as a link to other learning material in a document; b) interaction between learners and learning content, for instance, students are triggered to perform a learning task; c) physical and mental interaction between participants, for example, students and teachers apply knowledge to solve a problem collaboratively [6]. Therefore, interactive online learning can be categorized into four types: learner-technology, learner-content, learner-instructor, and learner-learner interaction, which can function through technical, mental, and social communication in the process of learning.

2.2 Technological Tools for Online Interactive Learning

From a constructivist's perspective, learning refers to learners' active engagement in the meaning construction of their experiences [7], which put learner and learning as the focus of education. In other words, learners are expected to be actively engaged in learning, where they should be stimulated cognitively to construct their knowledge structure. There are two threads of constructivism: cognitive constructivism and social constructivism. The former refers to the construction of knowledge through absorbing newly-acquired knowledge based on prior experiences, while another stream emphasizes that knowledge acquisition should be achieved through participation in social interaction [8]. These two threads can relate to learner-content interaction and learner-learner interaction respectively, which are also two categories of interaction that are more closely linked to pedagogical design. Therefore, in this research, learner-content and learner-learner interaction are mainly studied.

Firstly, in terms of learner-content interaction, many tools are developed, one of whose main features is that they are designed to facilitate knowledge acquisition in a new way that can not be achieved without supportive technological tools. For instance, functions such as Stimulation and Field Trip in Nearpod can enrich students learning experience through three-dimensional visual learning tools, which cannot be provided without technological support. Also, take visual learning tools as an example, which can promote learning effectiveness by offering content with multiple media [9]. Videos as a kind of popular learning material can be related to passive pedagogy when students are merely asked to watch them. In this regard, Nearpod can provide functions that can equip each video with multiple-choice questions and open-ended questions to cope with this concern conveniently and thus, foster learners' active engagement.

Secondly, for peer interaction, online interactive learning tools mainly attach importance to creating a more supportive and encouraging communicative environment to increase participation and form a supportive online learning community, and thus, to improve learning effectiveness [10,11]. Take Nearpod as an example, Collaborative Board is an effective discussion tool where students can post opinions anonymously. In this way, learners can concentrate on opinions and other information

related to the topic, instead of other irrelevant details, such as one's appearance, voice, prior academic performance and so on. Anonymity brings equality by neglecting labels and backgrounds of individuals, in which students are empowered to express their thoughts, which can never be seen in traditional face-to-face classrooms.

3. Effects of Online Interactive Learning

3.1 Learner-Learner Interaction Can Facilitate More Effective Peer Communication

Tools that support online communication can stimulate effective learner-learner communication. Firstly, this kind of tool can provide students with a communicative environment with more ease, which can benefit those disadvantaged learners such as introverted students and other learners who are not good at the verbal expression in face-to-face communication, resulting in more participation in discussion [11]. An anonymous online discussion, which can be monitored by the teacher without anonymity, can bring equality to students' participation and encourage active engagement in most cases.

Secondly, due to the asynchronous interaction of online discussion, students can share thoughts with higher quality [12], since they are asked to share knowledge on a certain topic without adequate thinking and analysis of relevant materials due to lack of time and access to more information in need in a conventional classroom.

Thirdly, in an online learning environment, more engaging and high-cognitive-demand interaction can be achieved [12]. For instance, in the learning of functions in mathematics, students can see the movement of the line based on changes of numbers in a function through interactive educational games to conduct inquiry-based activities collaboratively, which is more interesting, educational, and time-efficient than lectures or the observation through static graphs in the classroom.

Lastly, online learning can create a mentally supportive environment for forming and expressing opinions, where learners can learn with clear instructions in written words or in accompany of peers with their understanding and responses, which all can be reviewed multiple times by learners to clarify understanding of a certain topic. Therefore, this approach is especially beneficial for challenging learning tasks, since this kind of task might bring a significant amount of anxiety to learners, which will be detrimental to learning per se.

3.2 Learner-Learner Interaction Can Develop Critical Thinking

The construction of knowledge usually requires critical thinking. Critical thinking is not a clearly defined notion though its significance is highlighted. Based on Bloom's taxonomy for information processing skills, it is proposed that higher levels such as analysis, synthesis, and evaluation are widely considered components of critical thinking [13]. Critical thinking is a kind of learning result that represents skills closely linked to inference, analysis, and use of autonomy, which can be developed through disciplinary knowledge learning and also can be transferred to other contexts [14]. After analysis of many pieces of research, it is reported that the asynchronous interaction provided by online learning can allow students to analyze and reflect more deeply and thus, generate discussion with higher quality and facilitate critical thinking [15].

Another aspect to understand interactive online learning's effect on developing critical thinking is that this learning mode can function through intersubjective understanding. This kind of understanding means the meaningful construction of knowledge in collaborative learning mode through intersubjective interaction, whose foundation is the lifeworld, based on which learners reflect their claims, identify disagreement with others and finally come to an agreement [16]. Therefore, learners might encounter new experiences from others, experience contradiction to their prior perception of the lifeworld, and make efforts to reconstruct their knowledge structure and justify new knowledge. Second, an important feature of peer interaction is that peers can affect one another by forming a framework of reference for individual action within a group through mutual action, and thus, individuals might be guided to make more responsible decisions [16].

3.3 Learner-Content Interaction Can Support Individualized Learning

In the constructivist's view, learners are the center of education, therefore learning process should take individual learning differences into consideration [17]. However, the importance of individual learning needs is never neglected but it is difficult to be satisfied in the traditional classroom due to limited temporal, human and other resources.

Online learning encourages learners to take more control and exercise more autonomy compared with the traditional learning mode since the teacher is physically absent. When learners are empowered in the learning process, their learning motivation might increase since they feel more capable of making decisions and causing an impact on the learning outcome. With the rapid development of online learning tools, this regard is emphasized and many functions are provided to support it. For instance, to support individualized learning, Nearpod creates a supportive learning platform by providing a convergence to serve various educational purposes so individuals of various competencies can feel more confident with learning. Also, this platform supports asynchronous learning and thus, students can have more control over their learning pace and choices of learning content.

Adaptive learning is a concept that is closely linked to online individualized learning, which is defined as a kind of educational technology that serves for learner-content interaction by providing individualized learning experience automatically [18]. First, this learning technology should be based on the collection of learners' data on learning activities, which, for instance, includes students' interaction with both learning materials and peers [18]. Second, this category of technological tool is welcomed for its economical and productive efficiency compared with approaches of customized learning in the face-to-face learning environment, though its investment could be relatively high initially [18, 19]. However, it is undeniable that learning is not a linear process, and adaptive learning is not a perfect solution for individualized learning. However supportive and smart the technology might be, it cannot predict all the complex demands and reactions of individuals. Additionally, too much support might cause damage to autonomy since learners are not encouraged to use agency to identify their own needs and make decisions to react to these demands.

4. Optimizing Applications of Online Interactive Learning

4.1 Suggestions for Effective Online Learner-Learner Interaction

To begin with, many aspects of peer interaction should be carefully arranged to encourage active engagement in online learning communities. For instance, the selection of topics for online discussion, the group size, the mechanism that ensures effective participation, and the utilization of anonymity are factors that can affect the effectiveness of online learner-learner interaction. Firstly, topics for online discussions should be related to participants' prior experiences, which means that learning tasks should be understandable to students. Also, there should be topics that are of high-cognitive demand which are ill-structured and can be solved with unpredictable approaches so that learners are expected to actively participate in discussions [20]. Secondly, the number of group members should be neither too small nor too large. Normally, three to five students in a group are appropriate for collaborative learning [20]. Thirdly, there should be mechanisms to activate and ensure participation. For instance, members can be assigned roles that are challenging and can guide them to think of a topic from different perspectives, and a combination of anonymous posts to peers with visible individual participation to the teacher can be adopted to create an environment with ease to increase participation.

Furthermore, make good use of peer interaction to make good use of feedback. As mentioned, in an online learning community, the exchange of information among peers can provide a framework of reference to affect individuals' ideas and actions. Therefore, this interaction should be utilized to provide effective feedback through self-assessment and peer assessment. The instructor can achieve this goal by designing learning activities that urge students to share their learning outcomes and leave comments on others' works from different perspectives. Alternatively, students can also acquire

quantitative self-assessment through interaction in competition, which can be efficiently implemented with the support of online tools.

Additionally, encouraging students' manipulation of knowledge is an effective method to increase the effectiveness of peer interaction. It is illustrated that students' analysis and reorganization of information can facilitate active learning behaviors [21]. For instance, peer teaching can positively have impacts learning and collaboration [22]. This approach functions through perspective shifting, which can encourage students to process knowledge more deeply to make what they deliver understandable and educational to peers. Also, it is reported that students' motivation can be improved since what they learned is perceived to be useful since knowledge can be applied in peer tutoring instantly [21].

4.2 Suggestions for Effective Online Learner-Content Interaction

First, the selection and organization of learning materials should be carefully decided. For instance, due to the limitation of working memory, interactive learning materials which consist of multiple-source information that exists in a form of complex networks can be a huge challenge to learners and they might feel disoriented. In other words, when users encounter too many options, they will feel overwhelmed instead of more empowered and capable. Therefore, a supportive online learning environment does not equal more options and more learning materials for learners.

Second, though complex hypertext could be overwhelming to learners, students should be guided to form the ability to handle this situation. On the one hand, it cannot be denied that this complex and network-like form of information is exactly the environment that students are expected to cope with in the information society. On the other hand, this form of knowledge provided by the internet also results in an outstanding advantage brought by online learning, which is a global community of countless pieces of information that can be exchanged rapidly and frequently. Therefore, adequate guidance should be offered by the instructor to help learners to become qualified users in online interactive learning communities.

Third, individualized learning should be emphasized in online interactive learning. As an important feature of online learning mode, functions that can serve individualized learning should be made good use of. For instance, the instructor can design learning tasks and arrange learning materials that suit students of different learning styles: field-dependent learners need more systematic and detailed instruction since they incline to pay attention to hints from the environment and social interaction, while field-independent students tend to focus on knowledge itself and they prefer learning through discovering of knowledge [23]. However, it is undeniable that learning is not a linear process, and adaptive learning is not a perfect solution for individualized learning. However supportive and smart the technology is, it cannot predict all the complex demands and reactions of individuals. Additionally, too much support might cause damage to autonomy since learners are not encouraged to use an agency to identify their own needs and make decisions to react.

4.3 Design of an Online Interactive Lesson

The topic of this lesson is Climate Change and Trees. It is designed for students in the seventh grade. There are two parts to this lesson: the first part is a brief introduction to climate change and global warming; the second part aims to guide students to understand trees' values in modern cities, especially their importance in combat global warming, and how should this importance be made good use of.

To design an interactive online course, many functions can be utilized in Nearpod to achieve learner-content interaction. For instance, visual learning tools, which are reported in cognitive sciences that can improve learning [9], are utilized in a form that watchers are actively engaged. At the beginning of this lesson, students can have a field trip to an exhibition about climate change through virtual technology, where learners are asked to share thoughts on the picture that they are most interested in, so that students' prior knowledge of climate change can be activated. Further, there are three interactive videos in this lesson as learning materials, which encourage learner-content

interaction through open-ended questions and multiple-choice questions to clear and reinforce learners' understanding of knowledge in different parts of the video. Also, learning materials are designed for inquiry-based activities in order to develop cognitive skills, where students are expected to construct concept maps and inference maps as learning outcomes in this lesson and draw a mind map of this whole class as their homework.

In terms of learner-learner interaction in this class, at the beginning of the class, a simple sharing of a most interesting picture in an exhibition about climate change is designed. Then an interactive game is included at the end of the first part to perform as an interesting anonymous competition, where learners can form self-assessments on their own understanding with relative ease through the ranking of the game. The second part is featured by collaborative learning since the participators in the learning community is assigned to a learning group that consists of three members and paired with a group for peer assessment. They are expected to construct two kinds of maps through interaction within a group to manipulate information and share visualized learning outcomes in the collaborative board to facilitate interaction in a class. To ensure the effectiveness of peer interaction on a class level, each group are asked to analyze the maps of the paired group and post comments on learnable points and suggestion for improvement, which function as peer assessment. Also, to encourage individual construction of knowledge structure of this whole lesson, each learner is required to construct a mind map based on their individual learning experiences and share this visualized learning outcome anonymously to provide a reference for self-assessment.

5. Conclusion

As an important feature of effective online learning, interactivity is not attached to enough significance in research and pedagogical practice. Interactive online learning can be categorized into four types, which include learner-learner, learner-content, learner-technology, and learner-instructor interaction. The first two kinds of interaction are more deeply affected by pedagogical design, and thus they are mainly researched. This research discusses technological tools that support these two categories of interaction and their effects. Learner-learner interaction can facilitate more effective peer communication and develop critical thinking, while learner-content can support individualized learning better than learning in the face-to-face conventional classroom.

To optimize an interactive online learning environment, factors such as the selection of topics for online discussions, the group size, the mechanism that increases effective participation, and the utilization of anonymity should be carefully considered in learner-learner interaction. Further, feedback can be adopted through self-assessment and peer assessment, and students' manipulation of information should be encouraged through learner-learner interaction. Concerning learner-content interaction, the instructor should carefully arrange network-like learning materials and individualized learning content should be designed to meet diversified learning demands. Therefore, an interactive online lesson is designed by using functions in Nearpod as an instance, in which technological tools such as interactive videos, a collaborative mapping platform, a competition game, a anonymous sharing platform, and discussion forums are integrated to facilitate the effectiveness of interaction.

This research analyzes interactive online learning from the definition, technological tools, effects, and application, which can provide more analysis for interactivity in the online learning community and the improvement of the effectiveness of online learning. Furthermore, high-quality online learning can enable cost-effective teaching and training, which can have a profound impact on the equality of education through convenient access to learning resources of high quality. However, learner-technology and learner-instructor interaction are not analyzed in this research, and the application of online technological tools is not discussed deeply based on the categorization of existing online interactive learning tools. Thus, further research is expected on these two aspects to improve effective online interactive learning.

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