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Review

A Review of Nontraditional Teaching Methods: Flipped Classroom, Gamification, Case Study, Self-Learning, and Social Media

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Abstract: Traditional teaching methods rely solely on the use of textbooks, but teaching effectiveness assessment methods have demonstrated that most students taught by this method do not absorb the course content up to the expected level. Multiple researchers have introduced nontraditional teaching methods, but there is no scientific consensus on the best nontraditional teaching methods that are tailored to learners' abilities while most effectively addressing the course objectives. Therefore, the goal of this review was to address the following questions across all engineering disciplines, based on learners' abilities and the course objectives: (a) What are the benefits of nontraditional teaching methods? and (b) How would you categorize the benefits of nontraditional teaching methods? A qualitative review was conducted to achieve these goals, and the initial search for papers, using relevant keywords, resulted in more than 2000 peer-reviewed articles that were published between 2000 and 2017. A total of 125 peer-reviewed articles pertaining to the most frequently studied nontraditional teaching methods were comprehensively studied and analyzed. The analysis resulted in practical guidelines, including a list of the benefits of the five studied nontraditional teaching methods (flipped classroom, gamification, case study, self-learning, and social media) belonging to four categories: technical/professional, personal skills/ability, personal attitude, and time and space. Based on the results, the authors established significant guidelines for instructors who aim to optimize learners' achievements by adopting the most effective teaching styles, based on their course objectives and the learners' abilities.

Keywords: review of methods; flipped classroom; gamification; case study; self-learning; social media

1. Introduction

Education is a fundamental component of every society that substantially contributes to various aspects of a country's growth [1–7], and sustainable economic growth is not achievable for any country without investment in education [4,8]. Therefore, the acquisition of knowledge and skills has become the focus of many countries' development [9,10].

Traditional education methods are based on instructors explaining topics in a textbook, so learners are not active participants [11,12]. Nontraditional teaching methods, however, awaken learners' curiosity and creativity, and motivate them to participate in class activities [13–16]. To optimize learners' achievements, various nontraditional teaching methods have been introduced in the last two decades by multiple researchers and authors [17–23]. Since it is not possible for instructors to offer a tailor-made course for each learner in a classroom, many authors and researchers have made major efforts to determine a unique teaching method that would be effective for different types of learners Accordingly, as learners have different abilities and skills, it is not possible to find one unique method that is best for all learners [19,24].

The authors of this study studied various nontraditional methods and concluded that the most frequently studied nontraditional methods are flipped classroom, gamification, case study, social media, and self-learning. In 2000, the authors of [25] defined the flipped classroom method as "events that have traditionally taken place inside the classroom but now take place outside the classroom and vice versa." In 2011, the authors of [26] defined the gamification method as "the use of game design elements in non-game contexts." Yin defined the goal of the case study teaching method as to "investigate contemporary phenomena within its real-life context" [27]. In 2010, the authors of [28] defined the self-learning education method as one in which learners can use tools and resources however they wish to enhance their knowledge, abilities, and skills, and attain their individual objectives. The new generation is referred to as "net students" in the social media teaching method, because they rely heavily on electronic devices for different aspects of their lives [29,30].

Despite impressive growth in the use of these nontraditional methods by educators, no author or researcher has performed a comprehensive overview and analysis of them; therefore, this review intends to present the state of the art regarding the benefits of the five targeted nontraditional teaching methods based on learners' abilities and course objectives across all engineering disciplines. The results of this study can assist instructors and professors with selecting the teaching method(s) that most effectively meet(s) the learning objectives of their courses.

2. Research Questions

To attain the objectives of this review, the authors analyzed the abovementioned 125 peer-reviewed articles to find the answers to the following questions:

(1) What are the benefits of nontraditional teaching methods?
(2) How would you categorize the benefits of nontraditional teaching methods?

Furthermore, the authors made efforts to find answers to the following questions:

(a) What type of data collection method was adopted for each of the targeted nontraditional teaching methods?
(b) What trend of study is associated with each of the targeted nontraditional teaching methods?
(c) What is the distribution of adopted data collection methods for each of the targeted nontraditional teaching methods?

3. Literature Review

3.1. Flipped Classroom

Students taught by the traditional method commonly spend most of their time learning from lectures given by instructors in the classroom, working on assignments, and solving problems at home. The flipped classroom, which is also known as the inverted classroom method, is changing the role of duties performed in class and at home [31–33]. In a flipped classroom environment, theoretical knowledge from lectures and course materials are posted online for the students to study prior to the class session [31]. Then, in class, the learners interact with the instructor to discuss the topic, clarify open questions, and solve exercises [33]. In 2013, the authors of [34] observed that learners participating in the flipped classroom performed better or at least as well on comparable quiz questions. While learners initially struggled with the unfamiliar format, they were able to adapt quickly, and found the flipped classroom format to be effective and advantageous. Similarly, the authors of [35] explained that the short-term performance of learners who were taught by the flipped classroom teaching method improved considerably. In 2016, the authors of [36] examined the pre-test and post-test results of learners to assess the effectiveness of the flipped classroom technique, and found that, although a few learners having challenges associated with the time requirement, there was overall a considerable improvement in their performance. In 2010, the authors of [37] likewise adopted the flipped classroom and observed a 21% improvement in learners' performance. In 2017, the authors of [38] classified learners into three groups, low-, medium-, and high-performing, and emphasized that the learners with the lowest performance benefitted the most from being more involved in the class and being motivated to learn. Thus, many researchers have noted that the flipped classroom teaching method has gained importance in many engineering fields, such as computer engineering, civil engineering, mechanical engineering, etc. [39–44].

In 2014, the authors of [18] suggested nine design principles for optimizing the achievements of learners taught by the flipped classroom teaching method. The first three principles were: (1) provide an opportunity for learners to skim the material that will be covered in class prior to the class meeting, (2) create incentives for students to prepare before class, and (3) organize a system that evaluates the learner's level of learning. The other six principles were to organize, direct, and make connections between in-class and out-of-class activities; provide precise and detailed guidance; allow sufficient time for learners to complete the assignments; facilitate the easy formation of a learning community; give swift feedback on individual or team assignments; and enhance familiarity with user-friendly technologies.

3.2. Gamification

In 2009, Aldrich classified learning into two categories: learning to know, and learning to do [45]. Learning to know is gaining knowledge through stories, lectures, music, and other sources, but learning to do means learning by doing, such as practicing or experimenting by playing games.

The gamification teaching method became very popular shortly after its inception simply because most learners love gaming [46–48]. Huotari and Hamari [46] and Hamari [49] defined gamification as a continuous procedure of improving learning ability with motivational affordances to invoke gameplay experiences and achievements.

Many studies have been conducted to investigate the benefits of implementing the gamification method, and they revealed that learners are more engaged [50] and motivated [22,51] during class time. In addition to the competition and scoring in gaming engaging learners more fully [52], the interactions between players positively impact learners' social skills [53]. To obtain the optimum results, the games must be carefully designed to enhance interaction and active participation, rather than merely providing entertainment [52]. It is also essential, of course, to focus on the fundamental elements that make the process of gamification appealing [53]. For instance, Burguillo [52] believes that scoring and competition motivate learners to try harder. In 2016, Tan and Hew [54] explained that playing games that utilize scoring, badges, and a leaderboard has benefits for learners.

Video games are generally designed to propose an extensive range of multiplayer interaction mechanisms that are integrated as rules [55]. These mechanisms facilitate cooperation among players to achieve a common goal, such as trying to impair other players or outperform them, and help players build individual in-game identities by assuming meaningful roles and receiving recognition from other players [56].

3.3. Case Study

Traditional teaching methods have been implemented for many years in schools and universities, but they do not provide graduate students with the best opportunities for gaining sufficient knowledge, skills, and abilities that are fundamental to their future occupations [57]. Moreover, students in engineering fields need to have in-depth theoretical knowledge, but often have no idea how to apply it to real-life situations [58–60]. The case study method originated from the mentioned gaps in the students' knowledge and abilities, and utilized a method for enhancing higher-order cognitive skills. As an added benefit, it meets the relevant Accreditation Board for Engineering and Technology (ABET) criteria [61–63].

In 2006, the authors of [64] explained that the case study method is particularly valuable for improving problem-based learning, which requires both self-directed and teamwork skills. In 2008, Brown [65] stated that the case study method is a human-centered approach that equips graduate students with the skills necessary for success in their careers by providing a means of integrating the needs of people with the benefits of technology.

In 2010, Popil [66] observed that critical thinking ability was enhanced in students when case studies were implemented as a teaching method. Based on his experimental results and an increase in student performance, Mayo [67] concluded that case-based instruction promotes critical thinking. In 2014, Yadav et al. [68] observed that the conceptual understanding of learners was substantially enhanced when they learned from case-based instruction, as compared with traditional teaching methods. Additionally, the mentioned authors explained that the case study teaching method assists learners in becoming more engaged and connected to the real world. In 2011, Gavin [69] conducted research in which approximately 70% of learners asked to include this method in other curriculums, and roughly 90% said that they attained useful knowledge from this curriculum.

3.4. Self-Learning

The authors of [28,70] noted that all of the procedures employed by the self-learning method are managed solely by learners to achieve their specific goals, and the instructor's role is to serve as an advisor. In 2011, Robertson [70] explained that the self-learning method engages learners in the learning process, as they schedule their assignments, assess the completeness of the assignments, and readjust their goals. In other words, implementation of the self-learning education method empowers learners, as they become more responsible for different facets of their assignments [71].

With the adoption of the self-learning method, learners can explore the course topics in detail and accelerate/deaccelerate their education according to their individual needs. The authors of [72,73] believe that the self-learning method can provide a foundation for lifelong learning. In 2007, Stewart [74] performed research on the self-learning education method, and observed that learners were motivated by a deep desire for learning, and tried hard to complete their program in order to gain work experience.

In 2016, Karimi [75] explained that learners who are motivated to try social technologies and/or are actively engaged in the learning process are most likely to use the self-learning education method. Social technologies provide self-learners with an interactive and engaging environment in which they can improve their learning skills, abilities, experiences, and outcomes [76]. The Internet is considered an important source for the self-learning teaching method [77]. For instance, YouTube, similar to many other social technologies, assists learners in controlling what to learn and how to learn [78], when to learn, and where to learn. In addition, students can control their learning process by using mobile devices to improve creativity. Study materials can be self-explored by learners and/or provided by an instructor.

3.5. Social Media

Social media, such as Facebook and Twitter, is popular, especially among younger generations [79–82], and the Internet is a vital element of the daily life of college and university students, impacting their lives in various areas, including learning [83]. In 2014, Dogoriti et al. [84] stated that computer-mediated social networks have become an important part of the lives of university students, who are increasingly integrating them into their studies.

Social media applications have many benefits, including their availability—-being everywhere, any time. In 2013, Tess [81] listed the benefits of these applications: user-friendly, flexible, accessible anytime, and enjoyable. For example, Facebook is perceived by students as an effective learning tool that facilitates interactive discussion, and Twitter is efficient for maximizing the time spent per message, providing prompt feedback, and promoting active learning. As a result, many researchers have recommended the utilization of social media applications as an educational platform [85,86]. In 2013, Voss and Kumar [87] explained that, with social media applications, learners are able to share information with other learners and adapt quickly to a new form of communication and learning by using new media, such as blogging, text messaging, googling, social networking and game playing.

Thus, learners are actively engaged, and can gain additional functionalities by taking advantage of the powerful characteristics of social media [81,88].

In 2015, Hamid et al. [89] found multiple benefits of implementing the social media education method: enhanced engagement and involvement in the learning process, peer learning, promotion of critical thinking, self-directed learning, self-monitoring of the learning progress, a platform from which learners can interact with instructors, and an enjoyable and interactive learning environment.

In 2011, Junco et al. [90] conducted a study on the effects of using Twitter as a social media education platform. The 125 students who participated were subdivided into two groups: an experimental group (70) and a control group (55), and were given two assignments to complete with the help of Twitter. This was followed by class discussions and event announcements, using Twitter, to assist the students if needed. The social media education method enabled the students to connect not only with the instructors, but also with other students who were participating in the class activities and enrolled in the subject. The results demonstrated that the students were considerably more engaged and involved throughout the education process, and their average grades substantially increased.

4. Research Methodology

A five-step research methodology was developed to fulfil the objectives of this study. The research methodology is presented in Figure 1.

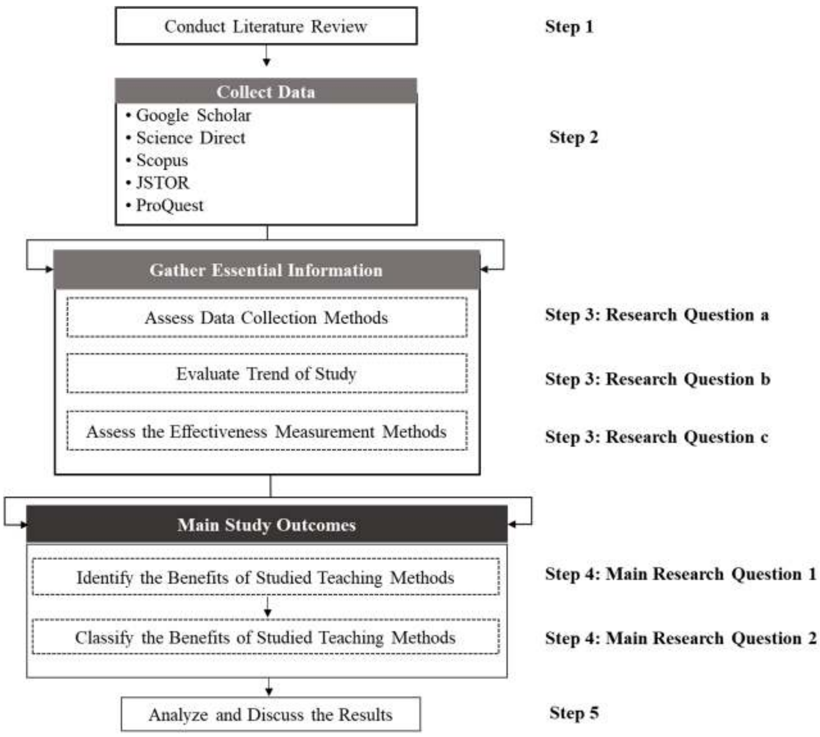

Figure 1. Research methodology.

The first step was a comprehensive literature review. In the second step, we collected relevant scientific publications, using several search engines such as Google Scholar, ProQuest, Science Direct, JSTOR, and Scopus. In the third step, essential information was collected to find the answer to three research questions. In the fourth step, the main outcomes of the study were presented and divided into two substeps: (1) the benefits/advantages associated with the five studied teaching methods were investigated and identified; and (2) the benefits of the studied methods were classified, based on the course objectives and similarities. In the final step, the findings and results were discussed and analyzed.

5. Data Collection

The approach adopted for this study's literature review was similar to those of previous literature reviews in the area of education in engineering [91,92]. The process of review for this study is presented in Figure 2. It was initiated by entering the following keywords into various search engines to collect relevant scholarly works: nontraditional teaching methods, innovative teaching approaches, educational methods, improving classroom teaching, interactive learning environment, teaching strategies, learning; teaching practices, engagement, motivation, etc. Approximately 2000 relevant peer-reviewed journal articles, conference papers, dissertations, and research reports published on higher education techniques were identified and collected. More than three-quarters of the papers were journal articles because of the rigorousness of their review process. The research team provided the following inclusion criteria to establish an appropriate database for this study:

(1) The scholarly works must be published in the English language;
(2) The scholarly works must have been published between 2000 and 2017;
(3) The scholarly works must have been published by one of the distinguished publishers such as IEEE, ASCE, MDPI, Taylor & Francis, etc.;
(4) The scholarly works must be associated with education in engineering;
(5) The scholarly works must pertain to nontraditional teaching methods.

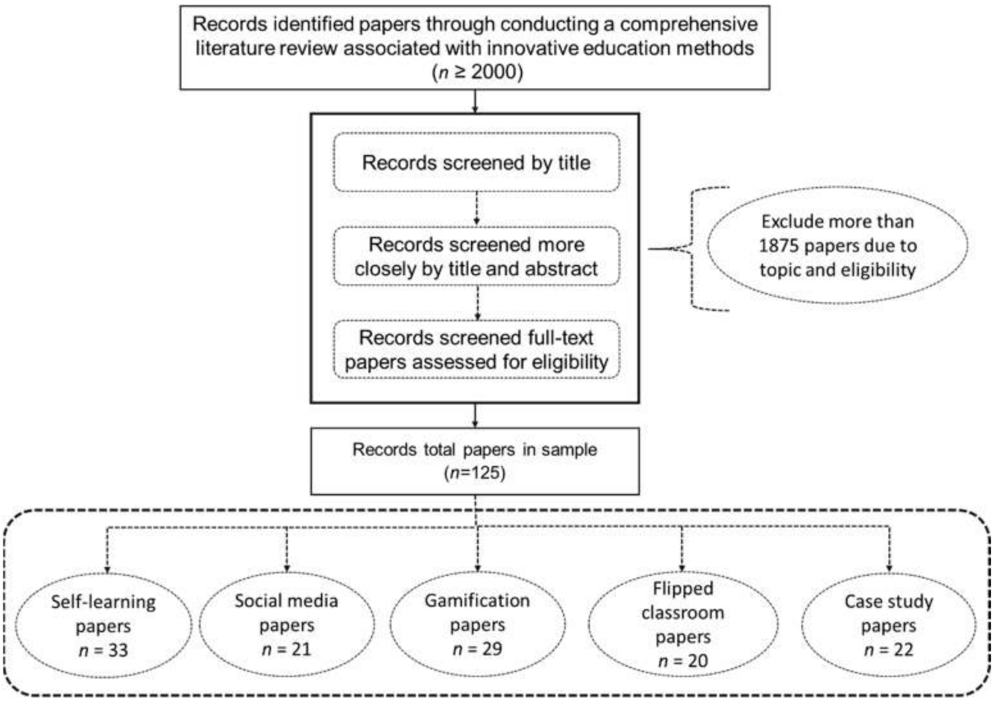

Figure 2. Process of paper search and selection.

The most frequently studied nontraditional teaching methods identified in the collected scholarly works were: flipped classroom, gamification, case study, self-learning, and social media. Only papers associated with education in engineering were retained; all others were excluded. After the retained papers were screened to assess their quality and eligibility, 125 papers remained; these were reviewed in depth to investigate nontraditional teaching techniques that could improve the involvement of engineering students in the teaching process.

6. Findings: Research Questions a, b, and c

6.1. Data Collection Methods

Many studies have focused on assessing the effectiveness of the five nontraditional methods. The distribution of data collection techniques was investigated by reviewing all of the journal articles identified for this study, and seven types of data collection methods were employed to assess the effectiveness of each teaching method: exam grades, quiz grades, interviews, case studies, surveys/questionnaires, assignment grades, and instructor reflection (see Figure 3). The distribution of surveys/questionnaires and the results of exams received the two highest percentages, 44% and 20%, respectively.

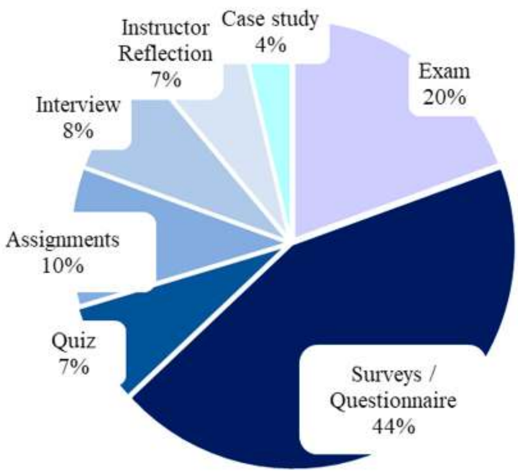

Figure 3. Distribution of data collection methods.

Some of the previous studies and their adopted data collection methods for their study and research are presented in Table 1. This table indicates that the distribution of a structured survey is commonly preferred by authors as a way to record students' perceptions, as well as analyze their grades. This data collection method simplified the organization of the collected data.

Table 1. Adopted data collection methods associated with targeted nontraditional teaching methods.

Data Collection Methods	Teaching Method	Previous Studies
Survey	Gamification	[54,93]
	Social Media	[82]
	Case Study	[68]
	Self-Learning	[94]
Exam	Flipped Classroom	[38,95]
	Gamification	[22,96]
	Case Study	[63]
	Self-Learning	[94]
Assignment	Case Study	[97]
	Flipped Classroom	[95]
Interview	Social Media	[89]
	Gamification	[54]
Quiz	Flipped Classroom	[95]
	Case Study	[68]
Instructor Reflection	Case Study	[63]
	Gamification	[54]
Case Study	Self-Learning	[98]

6.2. Trend of Study over the Years

In this step, the trends of the teaching methods studied through journal articles published since 2000 were investigated and analyzed by a two-step data screening process. Figure 4, which is based on the initial pool of collected articles, shows that flipped classroom, case study, and social media methods have been used increasingly over the last two decades.

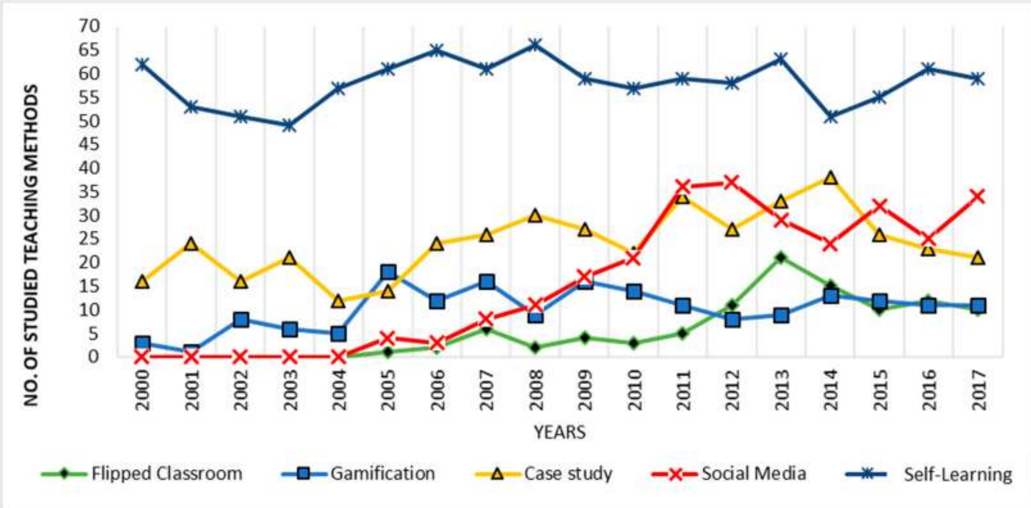

Figure 4. Trend of nontraditional teaching methods from 2000 to 2017.

Figure 4 illustrates that research conducted on the self-learning teaching method has been very trendy. A few studies were conducted on the social media teaching method between 2000 and 2004, but the number of studies increased dramatically after 2004, when the Internet became popular. Figure 4 clearly shows that self-learning and social media were the two most studied methods during the past two decades.

6.3. Effectiveness Measurement Methods

The distribution of different types of effectiveness measurement methods for the five studied teaching methods (flipped classroom, gamification, case study, self-learning, and social media) was investigated through reviewing the identified journals for this study, and the results are presented in Figure 5. This figure illustrates that the researchers implemented eight types of data collection methods: exam grades, quiz grades, interviews, case studies, surveys/questionnaires, assignment grades, presentations, and instructor reflections. The results indicated that the distribution of surveys/questionnaires received the highest percentage for the studied teaching methods. Hence, the survey distribution method became popular among researchers, as it is faster than other methods of data collection.

As indicated in Figure 5, to assess the success of the flipped classroom, six effectiveness measurement methods were used: quiz grades, exam grades, interviews, instructor reflection, surveys, and assignment grades. Exam grades were shown to be the most useful (31%), as they provided the instructors with an overview of the students' learning level that they could compare with documented traditional exam scores. Many other researchers used surveys and quizzes (26%) as a measurement tool.

Figure 5 shows that surveys/questionnaires were the most popular method for evaluating students' achievements from the gamification method. The researchers mainly relied on students'/instructors' feedback and survey responses. The second-highest rated way to evaluate the gamification students' achievements was exams.

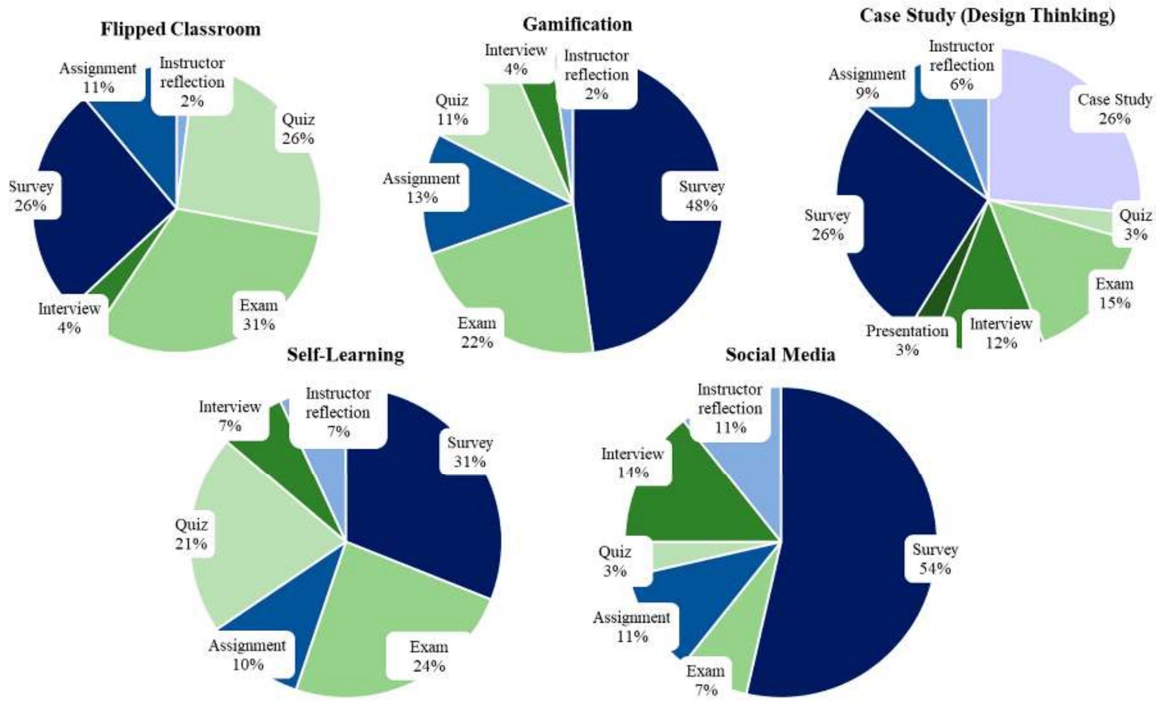

Figure 5. Distribution of data collection types associated with the studied teaching methods.

As shown in Figure 5, case study analysis received the highest distribution (26%) among all data collection methods used, revealing that accessing the detailed and confessional style documents was popular with the authors and researchers of the case study teaching method. The authors also considered understanding attitudes, cultures, and nonobjective aspects of learners' achievements as benefits to using this education method.

7. Results and Discussion: Main Research Questions 1 and 2

7.1. Benefits Belonging to Technical/Professional Category Associated with Targeted Nontraditional Teaching Methods

The benefits associated with each studied education method were identified, analyzed, and categorized in comparison to traditional teaching methods, and the results are presented in Tables 2–5. The benefits were classified into four categories (technical/professional, personal skills/ability, personal attitude, and time and pace) to provide a firm basis for assessing and analyzing them according to their particular/similar characteristics and benefits. Accordingly, an instructor could easily select the appropriate teaching method based on the content and objectives of the course.

Table 2 presents the benefits belonging to each technical/professional category associated with the five-targeted nontraditional teaching methods. Among the teaching methods, gamification and case study had the highest number of benefits. Adoption of the self-learning teaching method drives learners to assess accurately their current situation and study habits, thus helping them enhance their research skills and thinking abilities. According to the studies conducted by the authors of [99,100], adoption of the flipped classroom method positively affects students' abilities to obtain needed skills and gain advanced knowledge belonging to the technical/professional category.

Implementation of the social media teaching method creates opportunities for interacting with international domain specialists free of charge. For instance, it is more cost-effective to use Facebook than to make an appointment for face-to-face instruction. This method also improves learners' communication skills.

Table 2. Benefits belonging to technical/professional category associated with targeted nontraditional teaching methods.

Method	Benefits	Previous Studies
Flipped Classroom	Enhance ability to learn advanced knowledge	[99,100]
	Enhance ability to learn more knowledge	[34]
	Improve learning ability	[38]
Gamification	Improve efficient learning	[93,101]
	Useful for learning mathematics	[102]
	Increase in subjects' declarative knowledge	[103]
	Make learning vocabulary easy	[104]
	Improve engagement and willingness in a software engineering course	[105]
	Improve learning attitudes	[106]
Case Study	Make learning easy	[23]
	Create effective learning	[68]
	Increase learning performance during class time	[63]
	Gain in-depth knowledge, especially for graduate students	[107]
Self-Learning	Select desired area of learning	[94]
	Improve learning effectiveness	[108]
	Make possible lifelong learning	[109]
	Suitable for learners of any age	[108]
	Improve research skills	[110]
	Learn from a wide range of areas and fields	[98]
	Improve concentration for learning	[98]
	Enhance proficiency at using technology and media	[111]
	Improve engagement in the learning process	[112]
Social Media	Enhance engagement in the learning process	[17,90,113,114]
	Share opinions and knowledge easily	[113–116]
	Enhance proficiency at using technology and media	[117,118]
	High number of available resources	[117]
	Ease of access to resources	[117]
	Make possible lifelong learning	[119]
	Create opportunities to interact with international domain specialists for free	[120]

As illustrated in Table 2, the authors of [102] adopted the gamification teaching method to teach mathematics, and observed that learners were more involved in the learning process when they played a game that employed the use of fractions and answering questions to advance to the next level. This study concluded that students received higher grades for practical assignments after being taught by the gamification method compared to traditional teaching methods. In another study on students enrolled in civil engineering, architecture, and building construction management courses, it was observed that there was a 22% increase in learners' declarative knowledge of subjects [103].

7.2. Benefits Belonging to Personal Skills/Ability Category Associated with Targeted Nontraditional Teaching Methods

Table 3 indicates that all of the reviewed teaching methods consisted of benefits associated with the "personal skills/ability" category.

Table 3 illustrates that the flipped classroom drives learners to be more engaged in discussions and class exercises, thereby enhancing their participation. Additionally, when this method is implemented, the instructor is able to support learners with in-class exercises and assignments. In 2012, Karshenas and Haber [121] concluded that the adoption of the gamification teaching method can be beneficial, as the learner can imagine a real-life situation without experiencing the risks of actually being involved in it. For example, actually being present at a hazardous construction site would be more dangerous than playing a game involving hazards at a construction site.

Table 3. Benefits belonging to personal skills/ability associated with targeted nontraditional teaching methods.

Method	Benefits	Previous Studies
Flipped Classroom	Improve participation skills	[38,42,122]
	Enhance interpersonal skills	[32]
	Enhance problem-solving skills	[108]
	Enhance communication skills	[123]
Gamification	Enhance teamwork ability	[124]
	Improve clear and effective speaking	[125]
	Improve analytical and critical thinking ability	[125,126]
	Gain desired skills	[125,127]
	Improve problem-solving ability	[125]
	Improve social skills	[22]
	Enhance planning skills	[101]
	Enhance creativity	[128]
	Improve learning efficiency	[106]
	Improve visualizing skills	[121]
	Improve cognitive ability	[48]
	Improve self-confidence	[106]
	Improve imagining of real-life situations	[121]
Case Study	Improve skills of portraying something	[107]
	Enhance problem-solving ability	[23,69]
	Develop power of choice	[23]
	Enhance planning skills	[23]
	Improve efficiency in minorities	[68]
	Improve communication skills	[68]
	Improve critical thinking	[63,107]
	Assist in utilization of theoretical knowledge in real-life situations	[129]
Self-Learning	Improve self-assessment ability	[110]
	Improve self-directed learning ability	[108]
	Improve efficiency in female learners	[111]
	Improve self-management	[130]
	Enhance self-confidence	[98]
	Improve social skills	[112]
	Improve critical and analytical thinking	[98]
Social Media	Improve communication skills	[90,113,114,116]
	Improve creativity	[113]

In 2017, Li and Daher [42] conducted a study to assess the benefits of adopting the flipped classroom method for a water resource engineering course. Half (50%) of learners agreed that they were more involved in class activities in a blended design compared to a traditional method, and 52% of learners believed that class time was more useful and satisfactory compared to traditional education methods.

Furthermore, implementation of the case study teaching method can assist learners in gaining problem-based skills that result in significant improvement in their critical thinking and active participation in the learning process [107]. In 2012, Korkmaz [97] conducted research in which learners were exposed to case-based collaborative learning methods. This researcher observed that learners were more interested in the subject, learned more than they did by traditional methods, and performed exceptionally well in pre-and-post case study assignments, role-playing, and class discussions.

7.3. Benefits Belonging to the Personal Attitude Category Associated with Targeted Nontraditional Teaching Methods

Table 4 shows the benefits belonging to the personal attitude category. The gamification method is an effective method for teaching vocabulary, and game elements, such as points and rewards, which are key elements of this teaching style, increase learners' motivation.

Table 4. Benefits belonging to personal attitude associated with targeted nontraditional teaching methods.

Method	Benefits	Previous Studies
Flipped Classroom	Improve learning competence	[131]
	Enhance learning responsibility	[122]
	Enhance intellectual curiosity	[132]
	Enhance intrinsic motivation	[133]
	Enhance flexibility	[133]
	Enhance efficiency	[132]
	Enhance self-confidence	[39,40]
Gamification	Improve involvement through the learning process	[93]
	Increase learning interests	[93]
	Enhance engagement in the learning process	[93,106]
	Increase learning satisfaction	[48]
	Increase intrinsic motivation	[22,106]
	Improve learning attitudes	[106]
Case Study	Enhance participation in the learning process	[107]
	Improve responsibility	[23]
Self-Learning	Improve motivation	[108]
	Improve curiosity	[109]
	Improve satisfaction with learning	[94,108]

As Table 4 indicates, the implementation of social media technique is important for increasing student communication and engagement, and has the added benefits of eliminating or reducing boredom and intimidation in the classroom, and allowing students to feel more creative as they share their opinions and work together to achieve a common goal [96]. Twitter-mediated activities help students interact with teachers, communicate with their peers, enhance skills and knowledge through fellow students' posts, and stay motivated to study for weekly activities, and share thoughts and ideas [97].

7.4. Benefits Belonging to Time and Pace Category Associated with Targeted Nontraditional Teaching Methods

The last category of benefits is "time and pace," as shown in Table 5. This table illustrates that flipped classroom, self-learning, and social media teaching assist learners in managing their learning pace, and improve their ability to learn quickly. The social media teaching method is useful for live broadcasts and recording lessons, and allows the user to work at his or her own pace at a time that is convenient for them [98]. It also helps learners be prepared before the class [39], encourages them to spending more time learning, and imbues them with self-confidence to ask questions [134]. Students can manage their learning pace in the flipped classroom; therefore, fast learners save time by not having to wait for slower learners to catch up [135]. In 2015, Simpson and Richards [122] concluded that the majority of students feel that the flipped classroom method allows them greater flexibility and the ability to control their pace of learning, making them feel more responsible for their own learning. These researchers also indicated that this method provides a supportive and active learning environment that leads to enhancing interaction and engagement.

Table 5. Benefits belonging to time and pace associated with targeted nontraditional teaching methods.

Method	Benefits	Previous Studies
Flipped Classroom	Create the chance to prepare before the class	[39]
	Enhance ability of fast learning in class	[39,135]
	Encourage learners to spend more time studying	[134]
Self-Learning	Learn in an appropriate time	[77]
	Manage pace of learning	[122]
Social Media	Manage the pace of learning	[120]
	Learn any time it's convenient	[120]

In summary, the authors of this study made considerable efforts to perform a comprehensive study that could provide a useful guide for instructors by helping them select the most appropriate education method according to the course objectives. The benefits associated with the flipped classroom, gamification, case study, social media, and self-learning education methods were presented and it was shown that adopting these methods leads to active learning environments that improve learners' performance.

8. Limitations of the Present Study

Although the authors of the present study tried very hard to provide significant guidance for instructors on how to select the most appropriate nontraditional teaching method based on the course objectives and learners' abilities, the study contains some limitations. First, the list of relevant keywords used to collect a comprehensive database may not have been extensive enough. Although the authors were confident about the number of articles collected, there is still a possibility that we did not identify some relevant articles. Second, the main objectives of this study were to identify and categorize the advantages/benefits of the most studied nontraditional teaching methods (i.e., flipped classroom, gamification, case study, self-learning, and social media), and other nontraditional teaching methods were not studied. Third, this study investigated the benefits of the five targeted methods across all the engineering disciplines, but the benefits of nontraditional teaching methods across other scientific disciplines were not investigated.

9. Suggestions for Future Research

Future studies could investigate the nontraditional teaching methods not targeted in this study, to identify and classify their advantages/benefits based on the course objectives and learners' abilities. Future research could be conducted on the use of nontraditional teaching methods across all scientific disciplines.

10. Conclusions

Although there has been considerable growth in the number of researchers discussing the benefits of nontraditional teaching methods, no author or researcher has given a systematic overview and analysis. Therefore, this review aimed to encapsulate the current discussion regarding the benefits of the flipped classroom, gamification, case study, self-learning, and social media teaching methods, based on learners' abilities and course objectives across all engineering disciplines.

This study had two primary goals: (1) to identify the benefits of flipped classroom, gamification, case study, self-learning, and social media teaching methods for learners; and (2) to classify the identified benefits, based on their similar characteristics.

The results revealed that most researchers used surveys/questionnaires, which were collected from learners and instructors, to evaluate the effectiveness of teaching methods. The identified benefits of the nontraditional teaching methods were organized and classified into four main categories: technical/professional, personal ability/skills, personal attitude, and time and pace.

The identified benefits demonstrated that adopting self-learning and social media teaching methods helps learners manage their learning pace, and the gamification and case study methods improve students' planning and problem-solving abilities. The social media and gamification methods also enhance the creativity of learners. It was also concluded that the implementation of the flipped classroom, gamification, and self-learning methods improve students' intrinsic motivation and that the adoption of the social media method segues into lifelong learning and promotes creativity.

This study will help instructors select the most appropriate and effective teaching methodology for addressing their learners' needs and abilities, according to the learning objectives of the course.

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