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Implementation of the Chemo-Entrepreneurship Approach in Chemistry Learning: Systematic Review 2016–2023

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Abstract: Chemistry focuses on students understanding the principles, theories, concepts, and laws of chemistry and their application in real life, one of which is through the Chemo-Entrepreneurship (CEP) approach. This research aims to synthesize research related to CEP which focuses on research in chemistry learning. The research method used is Systematic Review (SR) by searching the Google Scholar and IOPscience databases from various journals and proceedings of national and international repute over the last eight years (2016-2023). Based on the search results, 46 relevant articles were obtained to be studied systematically. The research results show that 21.73% of the chemical topics that are widely applied in the CEP approach are colloidal systems. The concept of the CEP approach is contextual, which is linked to real objects, where students can learn the process of processing a material, packaging, and marketing products related to the material being taught. Effective implementation of the CEP approach through integrating learning media with various learning models. Thus, it is hoped that conducting this research will provide knowledge to teachers regarding the application of the chemo-entrepreneurship approach in chemistry learning.

Keywords: Chemistry learning; Chemo-entrepreneurship; Systematic literature review

Introduction

The 21st century encourages rapid changes in all aspects of life, especially education (Redhana, 2019). One of the changes that have arisen is the increasingly competitive world of work (Husain & Kaharu, 2020). These changes must be anticipated and put to good use, one of which is through the self-sufficient skills needed to deal with 21st century developments (Kadarisman, 2017). Trilling and Fadel identified three 21st century skills: learning and innovation skills, digital literacy skills, and career and life skills (Setyaningsih et al., 2019; Wikanta & Gayatri, 2018). Thus, career and life skills are very important for students (Lestari, 2017). This is because these skills can provide the ability and courage to face life's problems (Prayitno et al., 2016). The efforts made are instilling life skills and also developing attitudes through the material being studied (Triawan et al., 2017). One of them is by integrating entrepreneurship with chemistry subjects (Hamidah & Kamaludin, 2018; Andrean et al., 2019; Giri et al., 2020; Ni'mah & Kamaludin, 2023). The goal is to optimize the potential of creating products. Entrepreneurship education needs to be done to hone the skills, creativity, and skills of students which are very useful both in the school environment and in society (Rabialdi & Latisma, 2019).

Chemistry contains theoretical concepts (Fitriani, 2019), including reactions (Pikoli et al., 2022), formulas (Nurlaela, 2020), and chemical calculations (Lestari et al., 2021). In addition, most of the concepts in chemistry tend to be abstract (Mentari et al., 2017). This abstractness is difficult to imagine, so it requires an analogy to be drawn directly or through practicum

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(Junaidi et al., 2021). So students studying chemistry need sufficiently high and diverse provisions (Giri et al., 2020). This is what causes students to experience difficulties in learning chemistry (Muderawan et al., 2019). Besides that, chemistry can be found anywhere in life, so chemistry can be applied in daily activities such as entrepreneurship (Dewi & Mashami, 2019). Thus, there is a need for a chemistry learning approach that can attract students' interest in learning chemistry, one of which is through chemo entrepreneurship (Prayitno et al., 2016; Sanova et al., 2016; Prayitno et al., 2017; Rabialdi & La, 2019; Kurnia et al., 2022; Ni'mah & Kamaludin, 2023).

Chemo-entrepreneurship (CEP) is an approach to learning chemistry that can provide experience and be useful for students (Lestari, 2019). According to Afwa (2018), the CEP approach is one of contextual learning where students can relate the material to phenomena that exist in everyday life. The CEP approach allows students to learn the process of processing material into a product that is useful and has economic value (Marganingsih & Pelipa, 2018; Wibowo & Ariyatun, 2018; Nirwana & Yenti, 2021; Pupasari & Kamaludin, 2020). In addition, CEP can help students gain skills and knowledge that are very important in developing an entrepreneurial mindset (Kurniawati et al., 2021). However, several studies show that the application of CEP is not found in every sub-chapter, but only in a few sub-chapters. In addition, the CEP approach is mostly applied at the senior high school level, with only a few at the vocational school or university level.

Previous research on CEP mostly interacts through learning media (Prayitno et al, 2017; High, 2023) or through the use of learning methods or models (Carnawi et al., 2017; Dewi & Mashami, 2019; Purnama et al., 2020). Apart from that, CEP is implemented in practical activities both inside and outside the laboratory. Most CEP is applied in practical activities outside the laboratory, for example making ice cream, making aromatherapy candles, and simple purification tools that use tools and materials around them (Hartini & Azizah, 2019; Ni'mah & Kamaludin, 2023). However, prospective chemistry teachers' skills in chemo-entrepreneurship are still in the lower category (Dewi & Mashami. 2019). Thus, it needs to be explained further to obtain more comprehensive information regarding the implementation of CEP in chemistry learning. In this way, it can produce recommendations for researchers and educators. Prospective educators, so they can apply the CEP approach to learning chemistry.

This literature study is needed because it can provide a systematic review of a broader explanation of chemo-entrepreneurship in the last eight years and an explanation of the implementation of the CEP approach so that it is easier for teachers to integrate CEP in chemistry learning. The contribution of this literature study is that it can provide teachers with knowledge related to CEP in chemistry learning and recommend teachers to integrate CEP into chemistry learning well. This review discusses three research questions. First: What chemical subjects can be applied through the CEP approach in chemistry learning? How is the CEP approach integrated into chemistry learning? How is the CEP approach implemented in chemistry learning?

Method

This research uses a systematic literature review method. A systematic literature review is an observational method that follows standard rules for identifying and synthesizing relevant research articles (Xiao & Watson, 2019). The data collected came from the Google Scholar and IOPscience databases over the last eight years (2016-2023). Articles were obtained using the keywords "chemo-entrepreneurship", "CEP", "chemo-entrepreneurship approach" and "chemistry entrepreneurship". The process for selecting or filtering articles for review can be seen in Figure 1.

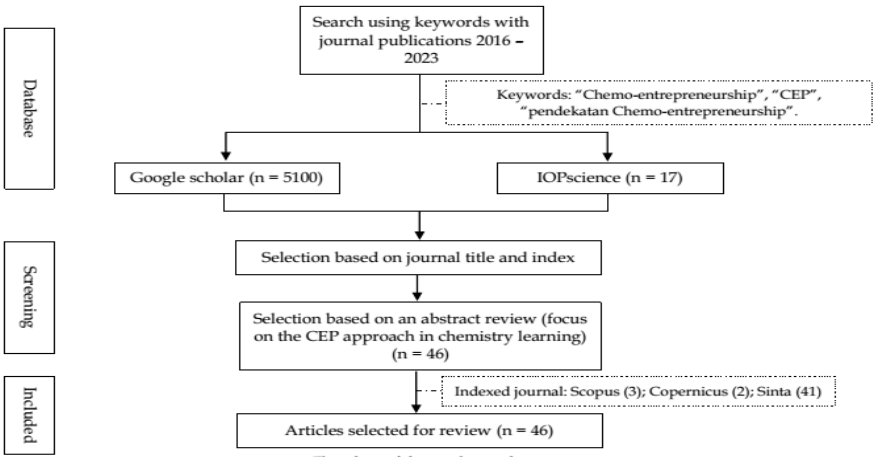

Figure 1. Flowchart of the article search process

The screening stage was carried out by reviewing articles that met the predetermined inclusion criteria as in Table 1. Articles were reviewed in stages by reading the abstract. If the abstract is appropriate to the research topic, continue by reading the contents of the article. Based on the screening results, 46 articles could be used in a systematic literature review, as listed in Table 2.

Table 1. Articles Criteria

Criteria	Description
Inclusion	Publication from scopus indexed journals or proceedings, copernicus indexed journals, and sinta indexed journals (S1 - S2)
	Research is written in indonesian and english
	Research conducted in educational settings (secondary education and higher education)
	The research focuses on chemistry subjects
	The research contains an explanation of the chemo entrepreneurship and entrepreneurship approaches in chemistry learning

Table 2. Results of Screening or Selection of Articles

Author	Article Title	Journal
Dewi & Mashami (2019)	The effect of chemo-entrepreneurship oriented inquiry module on improving students' creative thinking ability	Journal of turkish science education (Q2)
Purnama et al. (2020)	Implementing chemo-entrepreneurship-based inquiry learning on the acid-base concept to increase science process skills and students' interest in entrepreneurship	Journal of physics (Q4)
Budiarso & Hasanah (2021)	Application of stmcpe-based chemistry books with chemo-entrepreneurship orientation in the learning of acid-base solutions to improve students' creative thinking skills	Journal of physics (Q4)
Kurnia et al. (2022)	Studi respon siswa terhadap pengembangan multimedia interaktif berbasis chemo-entrepreneurship berbentuk aplikasi android	Hydrogen: jurnal kependidikan kimia (S4)
Ni'mah & Kamaludin (2023)	Development of a chemo-entrepreneurship practicum video to improve material understanding of colligative properties for senior high school	Jurnal penelitian pendidikan IPA (S2)
Arieska & Kamaludin (2018)	Pengembangan buku siswa berorientasi chemo-entrepreneurship (cep) pada materi ikatan kimia sma/ma kelas x	JTK (jurnal tadris kimiya) (S2)
Setyaningsih et al. (2021)	Development of chemo-entrepreneurship oriented learning design based on green chemistry	Journal of innovative science education (S3)
Prayitno et al. (2016)	Pengembangan modul pembelajaran kimia bervisi sets berorientasi chemo-entrepreneurship (cep) pada materi larutan asam basa	Jurnal inovasi pendidikan kimia (S3)
High & Alagich.(2023)	Design a sensor": implementation of entrepreneurial-minded learning in undergraduate general chemistry	Journal of chemical education (Q2)
Sumarti (2018)	Chemoentrepreneurship with cooperative integrated process inquiry strategy to increase students' entrepreneurial interest and learning motivation	Jurnal pendidikan ipa indonesia (S1)
Jamilah & Kamaludin (2019)	Pengembangan buku panduan pendidik berorientasi chemo-entrepreneurship (cep) pada materi ikatan kimia sma\ma kelas x	Jurnal pendidikan sains universitas muhammadiyah semarang (S3)
Sumarti et al. (2018)	Meningkatkan keterampilan proses sains melalui pembelajaran koloid dengan lembar kerja praktikum berorientasi chemo-entrepreneurship	Phenomenon: jurnal pendidikan mipa (S3)
Najib & Misrochah (2020)	Penyusunan petunjuk praktikum kimia berorientasi chemo-entrepreneurship pada larutan penyangga	Journal of educational chemistry (S3)
Sanova et al. (2016)	Implementasi penggunaan game simulation sebagai media chemo-edutainment dengan pendekatan chemo entrepreneurship untuk meningkatkan minat, life skill dan hasil belajar	Journal of the indonesian society of integrated chemistry (S3)
Ishak et al. (2021)	Penggunaan model pembelajaran project-based learning terintegrasi chemo-entrepreneurship dan hubungannya dengan life skill siswa dalam pembelajaran kimia	Jurnal inovasi pendidikan kimia (S3)

Author	Article Title	Journal
Pinta & Putras (2018)	The development of chemo-entrepreneurship oriented practicum guided for 10 th grade in senior high school	International journal of progressive sciences and high technologies (copernicus)
Wildana et al. (2022)	Design of chemo-entrepreneurship oriented teaching materials to analyze students' entrepreneurial creativity	Journal of educational chemistry (S3)
Wulandari et al. (2018)	Penerapan model poe (predict-observe-explain) dengan pendekatan chemoentrepreneurship pada materi pokok hidrokarbon terhadap hasil belajar dan keterampilan proses sains siswa kelas xi mia di man 2 mataram	The journal of educational development (S4)
Hartini & Azizah (2019)	The effectiveness of worksheet with chemo-entrepreneurship oriented on colloid matter to train creative thinking skill	Jpps (jurnal penelitian pendidikan sains) (S3)
Ulhaq et al. (2021)	Implementation of the ctl model with the cep approach to improve student learning outcomes and entrepreneurial interest in matter–properties and changes in vocational school	Journal of innovative science education (S3)
Arifin et al. (2018)	A development module of chemistry learning based on chemo-entrepreneurship oriented	International journal of progressive sciences and technologies (copernicus)
Wijayati & Rengga (2016)	Implementation of chemo-entrepreneurship teaching approach for improving students'life skills	Jurnal ilmu pendidikan (S2)
Triawan et al. (2017)	Pengembangan chemistry adventure sheets berorientasi chemo-entrepreneurship terintegrasi pendidikan karakter	Lembaran ilmu kependidikan (S1)
Pohan & Lubis (2019)	Pengembangan buku penuntun praktikum kimia berbasis chemoentrepreunership terhadap minat wirausaha mahasiswa universitas muhammadiyah tapanuli selatan	Jurnal pembelajaran kimia (S3)
Nugraheni et al. (2016)	Pendekatan chemo-entrepreneurship menggunakan flash sebagai media chemo-edutainment untuk meningkatkan hasil belajar	Jurnal inovasi pendidikan kimia (S3)
Wijayanti et al. (2020)	Development of chemical practicum guide oriented chemoentrepreneurship in colloid synthesis	Educhemia (jurnal kimia dan pendidikan) (S2)
Prayitno et al. (2017)	Penerapan modul kimia berpendekatan chemoentrepreneurship untuk meningkatkan kecakapan hidup dan motivasi belajar	Journal of innovative science education (S3)
Giri et al. (2020)	Pengembangan modul elektrokimia dengan pendekatan kontekstual chemoentrepreneurship untuk sma	Jurnal pendidikan: teori, penelitian, dan pengembangan (S3)
Wibowo & ariyatun (2018)	Penerapan pembelajaran berorientasi chemoentrepreneurship (cep) terhadap kreativitas siswa sma modern pondok selamat pada materi kelarutan dan ksp.	Jurnal tadris kimiya (S2)
Andrean et al. (2019)	Validitas dan praktikalitas modul sistem koloid berorientasi chemo-entrepreneurship (cep) untuk kelas xi ipa sma atau ma	Edukimia (S4)
Artani et al. (2021)	Pengaruh pendekatan chemo-entrepreneurship pada model pembelajaran inkuiri terbimbing berbantuan kahoot terhadap hasil belajar kognitif dan afektif peserta didik	Chemistry in education (S5)
(Ismulyati & Ikhwani (2018)	Pengaruh pendekatan chemo-entrepreneurship (cep) terhadap minat dan hasil belajar siswa sman 1 bukit kabupaten bener meriah pada materi perubahan materi	Lantanida journal (S4)
Imranah et al. (2020)	Analisis life skills mahasiswa kimia pada mata kuliah kimia pangan berbasis chemo-entrepreneurship	Chemistry (S5)
Milaningsih et al. (2023)	Pengembangan e-lkpd bermuatan chemo-entrepreneurship untuk menumbuhkan minat wirausaha peserta didik dengan bantuan flipbook dan liveworksheet	Chemistry in education (S5)
Nurjanah (2017)	Pengembangan lembar kegiatan siswa berorientasi chemo-entrepreneurship pada materi zat aditif makanan untuk siswa tunarungu kelas x di smalb-b	Unesa journal of chemical education (S4)
Kamaluddin (2018)	Chemo-entrepreneurship modelling on chemical bonding materials as an effort to grow entrepreneurial spirit of	International journal of chemistry education research (S4)

Author	Article Title	Journal
	students with hearing impairment in (islamic) senior high school.	
Wildana et al. (2022)	Validity of chemo-entrepreneurship teaching material to analyze students' cognitive in redox reaction	International journal of active learning (S4)
Muna (2022)	Development of chemo-entrepreneurship book entitled "peduli lokal, melek global": popularizing chemistry and developing life skills in industrial revolution era 4.0.	International journal of educational review (S4)
Dewi & Muna (2022)	Chemistry craft and entrepreneurship practicum module based on semi-solid preparations as a learning resource for high school students	Jurnal pendidikan kimia Indonesia (S2)
Rahayu et al. (2022)	Pengembangan media pembelajaran berbasis google sites bermuatan chemo-entrepreneurship pada materi gugus fungsi senyawa karbon	Lantanida journal (S4)
Hartini & Azizah (2019)	The development of student's activity sheet (sas) with chemo-entrepreneurship oriented on colloid matter in 11th grade to train creative thinking skills	Unesa journal of chemical education (S4)
Karunia et al. (2020)	Preliminary study of the entrepreneurial soul (enterpreneur) of high school students in scientific chemistry learning with a scientific approach	Journal of Innovative Science Education (S3)
Rabialdi & Dj (2019)	Pengembangan penuntun praktikum berorientasi chemoentrepreneurship pada kelas xi semester genap sma/ma	Selodang mayang: jurnal ilmiah badan perencanaan pembangunan daerah kabupaten indragiri hilir (S5)
Epinur et al. (2022)	Development of basic chemistry teaching material chemical education based on entrepreneurship	Jurnal penelitian pendidikan ipa (S2)
Fuldiaratman & Ekaputra, (2023)	Analysis of students' 4c skills based on project based learning through chemo entrepreneurship media	Journal of education and learning innovation (S4)
Kurniawati et al. (2021)	Pengaruh project-based learning berorientasi chemoentrepreneurship berbantuan e-lkpd terhadap keterampilan proses sains dan sikap wirausaha	Chemistry in education (S5)

Result and Discussion

Subject in Chemo-Entrepreneurship Learning

Chemistry learning based on chemo-entrepreneurship is chemistry learning associated with entrepreneurship. In addition to studying important materials, CEP-based learning can train students in entrepreneurship. Based on the analysis of 46 articles, it was found that the material that was widely applied in the CEP approach was colloid by as much as 21.73%. Several other chemical materials that are applied in CEP-based chemistry learning can be seen in Figure 2.

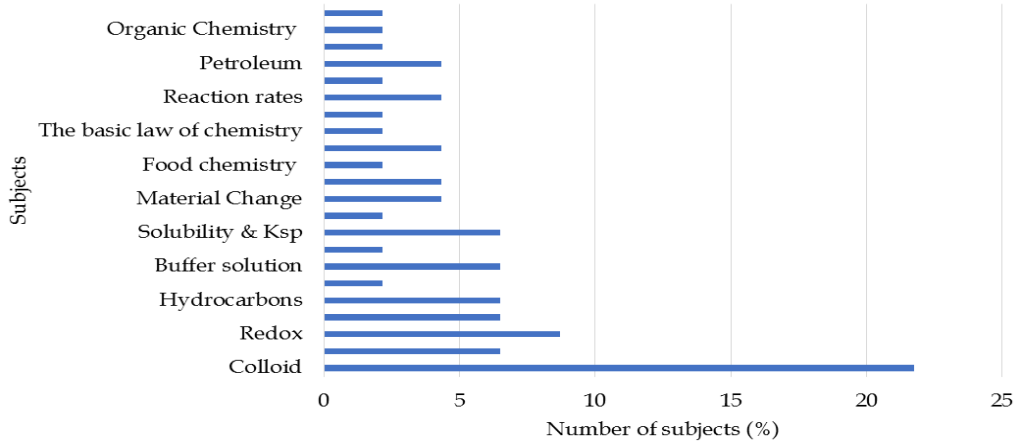

Figure 2. Subject in chemo-entrepreneurship learning

The selection of chemicals is generally based on subjects that are relatively easy to relate to real objects. In addition, it is based on chemicals that require high reasoning power to understand (Hamidah &

Kamaludin, 2018). Such as colloid, which is closely related to everyday life (Sari et al., 2017; Andrean et al., 2019; Hartini & Azizah, 2019; Najib & Misrochah, 2020; Wijayanti et al., 2020; Ishak, 2021) and colloid systems are also one of the chemicals that have abstract characteristics (Milaningsih et al., 2023). The results of research conducted by Dewi et al. (2019) stated that colloid system material is difficult to understand because of the macroscopic, microscopic, and symbolic characteristics of colloids. Likewise, acid-base material is very closely related to everyday life, so it is quite easy to provide learning in accordance with the expected basic competencies. The selection of other materials is mostly intended to train students in making industrial products. Most of these materials are applied at the SMA/MA level. Meanwhile, only a few materials were applied at the tertiary level, such as basic chemistry (f = 2), organic chemistry (f = 1), and food chemistry (f = 1) as well as matter properties and changes (f = 2) in vocational schools.

The Concept of the CEP Approach

The concept of the CEP approach to learning chemistry is contextual, which is associated with real objects. Learning with a contextual approach developed in Germany, namely Chemie im Kontext, which links understanding concepts with real-life phenomena (Nentwig in Giri, 2020). This approach can improve the quality of the process of chemistry learning activities because understanding basic concepts is built on context, so students find their understanding independently from various sources (Giri et al., 2020).

CEP-based learning teaches about the manufacture, packaging, and marketing of products related to the material being taught. Thus, in addition to studying important materials, CEP-based learning can train students in entrepreneurship. However, the essence of the CEP approach is not to shape students to become entrepreneurs but rather to grow interest in and inspire entrepreneurship through the learning process (Wulandari et al., 2018). Students must understand that entrepreneurship is a way of life and not just a business, and it is important to emphasize self-direction (Ead et al., 2023). Apart from that, with entrepreneurial skills they are expected to be able to build a career based on their innovation in the field of chemistry (Jennifer et al., 2022).

This learning process links chemistry with entrepreneurship through practicum activities (Pinta & Putra, 2018). According to Astuti, Al-Idrus, and Purwoko (2019), the application of learning with practicum based on everyday life can create more meaningful learning for students, make it easier for them to understand concepts, and also open up students' insights about the phenomena around them. Some of the chemical products that have been produced, such as the colligative properties of solutions for making ice cream, involve the concept of lowering the freezing point, syrup with the concept of increasing the boiling point, and salted eggs under osmotic pressure (Lestari & Premono, 2019; Ni'mah & Kamaludin, 2023). The manufacture of bar soap, jelly, and simple clarification tools is made according to the colloid principle (Dewi & Mashami, 2019; Hartini & Azizah, 2019; Wijayanti et al., 2020). Chemical bonds through the manufacture of MEc Bond, aromatherapy candles, and lava lamps. MEc Bond is intended to make it easier to learn Lewis structure material. Aromatherapy candles are related to intermolecular forces, and lava lamps are related to polarity (Arieska & Kamaludin, 2018).

Various other products applied include duck egg shell composite toothpaste, clam shell composite toothpaste, betel leaf extract soap, aloe vera soap, and used cooking oil soap, which involve the concept of salt hydrolysis, which lies in the ingredients present in the product. Toothpaste and soap contain basic salts that when dissolved in water, can undergo hydrolysis reactions (Milaningsih et al., 2023). This is supported by research conducted by Frank Jaksch (2016) Innovation and entrepreneurship in the fields of science and chemistry can have a real impact on a very diverse range of global markets, including food, medicine, agriculture, personal care, and energy, and others.

So, the concept of the CEP approach is to connect chemical material with entrepreneurship. What this means is the delivery of chemical material followed by an explanation of the opportunity to turn it into a business. For example, electrochemical material studies the working principles of accumulators and the coating of metals with other metals (electroporation). In theory, the battery will never be damaged (soaked) and the battery water will never decrease. Because the reaction of battery discharging and charging is reversible, namely: $Pb + PbO_2 + H_2SO_4 \leftrightarrow PbSO_4 + H_2O$ (Chang, 2005). However, in reality, the battery water is reduced, the battery is soaked and cannot be charged again. The business opportunity is that we can repair damaged batteries with new batteries based on the chemistry we have learned. Motorcycle battery profits can reach 400%. For example, buying a used motorbike battery is Rp. 30,000 and 1 bottle of hard battery water Rp. 7,500 (capital Rp. 37,500), the price of a new motorbike battery is around Rp. 200,000,- Likewise, with car batteries you can get a profit of 680%, buying a used car battery is Rp. 80,000 and 3 bottles of hard battery water Rp. 22,500 (capital Rp. 102,500), the price of a new car battery is around Rp. 800,000 (Epinur et al., 2022).

Implementation of the CEP Approach

There are two stages in entrepreneurship education: teaching and trying. In the teaching stage, teaching is carried out using learning media. The material taught concerns basic matters about entrepreneurship. Including report preparation, financial management, marketing, and others. At the trying stage, students are invited to play an active role and try to become entrepreneurs directly. For example, students play the role of group members in a startup where they have to work with the group in assigned roles to create a product then package, analyze, and market it (Drake & Rooney, 2021). Entrepreneurship education through entrepreneurial activities will require students to try to hone their abilities both in terms of personal, social, and vocational abilities (Imranah et al., 2020).

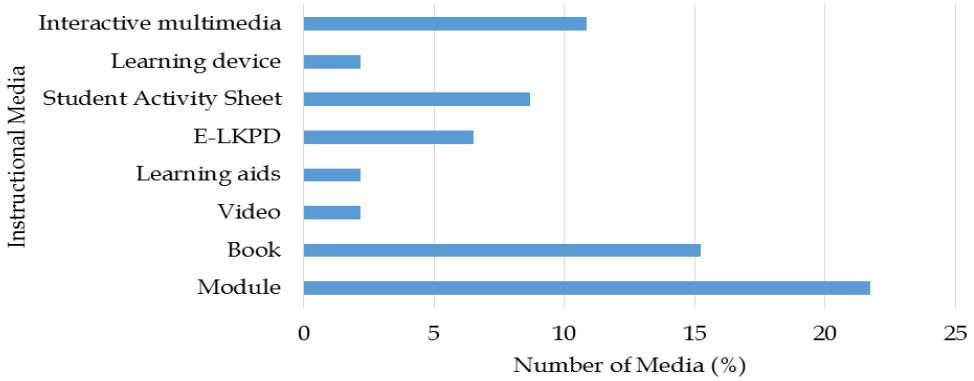

Figure 3. Learning media in the CEP approach

The implementation of the CEP approach is delivered using learning media. The CEP approach can be maximally applied to the learning process with the help of teaching materials (Triawan et al., 2017). Based on article analysis, 21.73% of the most widely used learning media are modules. Other media developed can be seen in Figure 3. Most of the learning media developed are in printed form, and only a few use interactive multimedia. Even though interactive multimedia is a medium that is quite interesting for explaining learning material (Kurnia et al., 2022). This is because multimedia combines text, art, sound, images, animation, and video (Kurniawati, 2018). The media developed was in the form of a practicum video on the colligative properties of CEP-charged solutions combined with Powtoon animation (Ni'mah & Kamaludin, 2023). Other media are packaged in the form of snakes and ladders games and quizzes, just like playing millionaire games in describing matter in the atomic structure and periodic system (Sanova et al., 2016). This learning media is used as a support for applying the CEP concept (Wijayanti & Rengga, 2016). The use of CEP-based learning media in learning can improve science process skills (f = 6), creative abilities (f = 3), material understanding (f = 1), learning motivation (f = 2), entrepreneurial interest (f = 14), life skills (f = 7), and learning outcomes (f = 6).

Implementation of Chemo-Entrepreneurship (CEP) can also be applied through the use of learning methods or models such as inquiry (f = 4), project-based learning (f = 1), problem-based learning (f = 1), STEM (f = 2), SETS (f = 1), and contextual teaching and learning (f = 1). CEP-based guided inquiry learning can improve students' science process skills (Aktamis et al., 2016; Sumarti et al., 2018; Purnama et al., 2020). This is because inquiry-based learning is a form of student-centered active teaching that helps students develop critical thinking through problem solving. Learning with the CEP approach through the guided inquiry model will foster an entrepreneurial spirit, which can be shown by several indicators that can be assessed, namely having curiosity, asking questions frequently, giving lots of ideas, feeling free to express opinions (actively), searching and analyzing data known for solving problems (Lestari & Premono, 2019).

Learning using the CEP approach to problem-based learning can encourage students to be more creative and train them to be confident in what they are doing. Other research shows that learning using the CEP-integrated project-based learning model is proven to be able to help students develop life skills in aspects of their vocational skills (Carnawi et al., 2017). In addition, by implementing a project-based learning model, indicators of science skills can be achieved starting with students' skills in observing, classifying, interpreting, predicting, communicating, hypothesizing, planning experiments, and applying concepts to asking questions (Salmi et al., 2017). Through PjBL, it can encourage students' learning motivation (Sudirman et al., 2019; Muliaman, 2021) and help them gain skills values that can build a strong foundation for the future in a globalized world (Kurniawati et al., 2021).

Thus, the implementation of the CEP approach can be carried out by integrating the learning model with the help of learning media. As CEP-oriented PjBL learning assisted by e-LKPD can improve science process skills and entrepreneurial attitudes (Kurniawati et al., 2021). This learning can train students to be able to design experiments, carry out experiments to create a product, and convey the results of experiments both orally in the form of presentations and in writing in the form of reports. The CEP approach to the Kahoot-assisted inquiry learning model can improve cognitive and affective learning outcomes (Artani et al., 2021). Through the guided inquiry learning model, students can answer questions about natural phenomena or events by conducting scientific investigations, while Kahoot can help students become active and interactive in the learning process.

Not only for SMA/MA (f = 34), SMK (f = 1), and Students (f = 6), the CEP approach is also implemented for deaf students (f = 3). Deaf children are children who have hearing problems and cannot hear sounds perfectly (Rahmah, 2018). These limitations cause the learning achievement of deaf students to be lower than that of normal students for abstract subject matter, especially chemistry (Waldany & Ulfa, 2022). Even though deaf students have limitations, that doesn't mean they can't participate in the learning process (Leton et al., 2021). Learning for deaf students relies more on the sense of sight (visual) because of barriers to language development. Thus, it takes learning media to support the learning process. Such as the use of CEP-based worksheets accompanied by picture language cues, using visual image media, and using simple sentences (Nurjanah, 2017). In its implementation, deaf students are invited to practice entrepreneurial concepts in the field of chemistry by making a product that has economic value (Kamaluddin, 2018).

Therefore, the role of the teacher is needed to achieve this success. Teachers are also expected to be able to carry out CEP-based learning, which is supported by the use of learning media that are interesting, useful, have economic value, and foster an entrepreneurial spirit (Sanova et al., 2016). To achieve this goal, teachers do need special assistance in sharpening and developing their professional abilities. One of them is through CEP's integrated soft skill learning training. In addition, there is a CEP-oriented teacher's handbook. In the teaching and learning process, the educator's handbook has an important role in supporting the implementation of the curriculum, and serves as a teaching reference for educators according to the learning approach used. Through this guidebook, teachers can carry out more varied chemistry lessons and provide entrepreneurial insights to students.

Conclusion

A systematic literature review was carried out to provide a general overview and knowledge for teachers regarding the application of chemo-entrepreneurship in chemistry learning to support quality education. The latest article used in this systematic observation provides information related to CEP in chemistry learning that can be applied through project-based practical activities. The results show that the topic of colloids dominates in CEP integration. The CEP approach allows students to study material and create products and design products in such a way that they have selling value. Effective implementation of the CEP approach through integrating learning media with various learning models. Recommendations for future researchers are to study further the integration of CEP combined with various learning models and media that can be implemented in chemistry learning.

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