Currents Trends in Use of Collaborative Learning in Teaching of Robotics and Programming – A Systematic Review of Literature

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***Abstract*—This Research Full paper presents a Systematic Mapping Study of actions that are being carried out in the academic environment, aiming at teaching robotics and programming through collaborative procedures at a distance. Recent studies point to an increasing utilization of collaborative activities in teaching-learning process of robotics and programming, favoring the STEM fields, with encouraging results regarding the improvement of student's skills and better use of educational institutions infrastructure. Our goal is to collect information about state of the art on collaborative learning, employed through Groupware. To carry out this investigation, goals were defined by the Systematic Mapping Process, with the purpose of providing a better process understanding. The Research Questions were stipulated to be answered after the results analysis and the Search Strings, which allowed to select publications that satisfy the objective of this research articles in main digital repositories, all carried out in the last 5 years. After applying filters, 22 articles were considered more relevant according to the research objective. The results show the activities, modalities, methodologies, accomplished pedagogical concepts and the conclusions obtained. This work aims to assist researchers who seek information on referred topic.**

Keywords—collaborative learning, groupware, robotics, programming.

I. INTRODUCTION

With the advent of Information and Communication Technologies (ICTs) applied in education, schools have undergone many changes in cultural and technological nature [1]. These changes mainly affected the way of learning and teaching, especially when teachers need to pass on knowledge to so-called "digital natives", a term created by Prensky [2] for the generation that grew up with easy access to modern technological devices. These students usually have good knowledge in information technology and many skills with technological equipment. Thus, they have a somewhat sophisticated way of learning than traditional styles. For that, educators have a large amount of emerging educational tools and approaches that aim to help students acquire knowledge.

Among the growing approaches, Collaborative Learning (CL) has gained prominence in international educational scenario. It is a form of learning focused on groups, that is, students work in pairs or teams, in which students learn in groups and try to help each other to achieve a common goal together [3]. The collaborative learning process has advanced with the facilities that online collaboration technologies have provided [4]. These educational tools have changed the educational landscape, allowing the growth of collaborative methods that conquer digital natives with social media and mobile devices. These elements are a constant presence in young people lives today, which makes the use of these important resources like educational tools accessible and easy to use.

Use of Collaborative Learning in educational environment can achieve satisfactory results when applied in the STEM approach (Science, Technology, Engineering and Mathematics). One of the areas that employs collaborative actions is computer programming. Among several studies produced, we highlight an experiment carried out by Hayashi et al. [5], applying collaboration with programming to develop a game in C language, showed that students, in addition to developing their programming skills, improved their self-confidence. Another area favored by collaborative actions is Educational Robotics. Li et al. [6] point out that many researchers consider teaching robotics to be fundamental and a trend towards technological teaching in the future. In their study, the authors highlight the importance of communication between students to achieve the group's goals, as they all participated in all stages of project's construction, improving the performance, design and programming of assembled robot.

With increasing use of Internet supported educational tools, virtual learning has accompanied this popularization and has favored teaching and learning in networks by remotely distributed groups, organized in virtual learning platforms. To this aim, Groupware emerged, which is a term used to describe one collaborative software to support group work, allowing communication, coordination, collaboration and information sharing [7]. Studies show that Groupware

solves problems of limited time and geographic space between group members. They make use of technological resources such as videoconferencing, hypermedia, chats and other means, all brought together in an integrated development environment with a high security level.

This study purpose is to collect information about the current's practices employed for use in robotics or programming, using Groupware to help learning in groups. This information can be used for to conduct future researches in this area and help researchers to find information this theme. The aim of this study is to perform a Systematic Mapping Study (SMS) to make a survey of articles that use Groupware in learning programming or robotics. To report the research, this article is structured as follows: Section 2 presents the SMS protocol; Section 3 shows the results of the analyzed studies, as well as an overview of researched articles; Section 4 describes the results obtained from the research and Section 5 displays the conclusions about the results.

II. Systematic Mapping Study

MSL is a method for building a classification scheme and structuring an interest area, where results analysis focuses on publications frequency within scheme [8]. The process involves identifying, selecting, evaluating, cataloging, synthesizing and analyzing published materials on researched topic. It is an important procedure in academic environment because the actions are intended to answer the research questions formulated in advance to assist or support future research in the specified area [9] [10].

In this paper, we use SMS because you get results in reports or results maps that take less effort and allow a more granular overview [8]. A map can be illustrated in tables or graphs, which shows information about the statistics of publications or quantitative trends. Figure 1 shows steps to carry out SMS for this research.

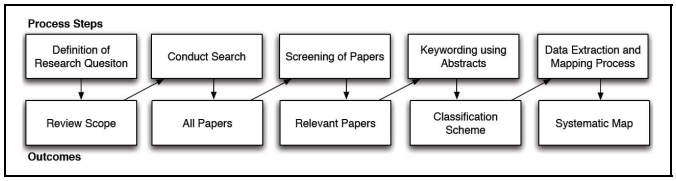

Fig. 1. The Systematic Mapping Process [8].

III. Methodology

The actions were based on the methods mentioned in the previous section [8] that provided steps for a good research and papers was sought in main repositories involved with Informatics in Education. The articles were extracted from the most relevant digital repositories in Engineering in Education area, such as those related to the ACM Digital Library, the IEEE Xplore Digital Library and Scopus.

Papers published in last 5 years were founds because we would like to collect the most recent information on this research subject. As the data collection and reading of articles were made between the months of September and December 2019 were considered studies published between 2014 and 2018.

A. Research Questions (RQ)

When a SMS is carried out, works published in a given area are sought to provide information to contribute to future research. For this purpose, research questions are elaborated that the study seeks to answer. Thus, the following RQs were determined:

RQ1: What collaborative activities were developed to promote Collaborative Learning using Groupware?

RQ2: What technological resources were employed them to perform collaborative activities?

RQ3: What degrees and modalities have Collaborative Learning been applied to?

RQ4: What Common Methodologies have been applied in use of Collaborative Learning?

RQ5: What pedagogical concepts were used in published articles?

RQ6: What do results of published works show?

B. Search Expression

To find articles that answer research questions in a SMS, the search must be conducted in an organized manner. For this purpose, the following search expression was defined:

("groupware") AND ("learning") AND ("robot*" OR "programming")

The strings were applied in the metadata (title, keywords and abstract) of digital repositories articles.

C. Inclusion and Exclusion Criteria

Application of search strings in the repositories returned several articles. Still following the techniques for a good systematic mapping and aiming to answer the proposed questions, criteria were established to include and exclude relevant or irrelevant articles, respectively, for the research. Table I shows these criteria.

TABLE I. Inclusion and Exclusion Criteria.

Inclusion Criteria	Exclusion Criteria
IC1: Primary studies published in journals and conferences that used the search string in their metadata (title, keywords, summary). **IC2**: Articles published between years 2014 and 2018.	**EC1**: Papers of Systematic Review of Literature, Systematic Mapping Study, Books or Book Chapters, Work in Progress and Short Papers. **EC2**: Duplicate articles. **EC3**: Articles with results that are not very relevant for use in this research, for research that did not carry out practical experiments or did not delve into the results.

In IEEE Xplore Library, after applying the search string, 342 published works were found. However, as one of objectives is to collect what has been produced in the past 5 years, the years filter has been applied on the site itself. As the focus of the work is on more dynamic research, the books were disregarded, leaving 96 selected articles. The process was repeated for ACM and Scopus libraries. In ACM library, 486 searches were found and after filters of last 5 years, 62 publications were left. In Scopus library, the application of search string returned 79 initial works and 17 in last five years.

Papers were manually downloaded and separated by digital library. After previous selection of articles, the sections of Abstracts, Results, and Methodologies used in 175 articles were read sequentially. The Exclusion Criteria defined above were applied, resulting in 22 selected articles, which were read in full and cataloged for analysis and results discussion. The total of publications found in the digital libraries and the selected totals are shown in Table II.

TABLE II. NUMBER OF ARTICLES OBTAINED AT EACH STAGE IN RESEARCH.

Digital Library	Search String	2014-2018	Filters		
			1st	2nd	3rd
ACM Digital Library	486	62	52	51	1
IEEE Xplore Digital Library	342	96	91	91	18
Scopus	79	17	16	15	3
Total	**907**	**175**	**159**	**157**	**22**

IV. RESULTS

The information was extracted for respond to this work research questions. We will show the results obtained from the selected articles, in order to and analyze its importance for application in collaborative distance learning in robotics or programming.

A. Annual Publications

Figure 2 shows the number of publications per year of articles found in this research, as well as a line that shows the trend of this number. We note that there was a growth in initial period and that there was a balance in the number of articles produced in recent years. The small number of articles that were cataloged doesn't imply that there was research in this area, but only that these researches did not fit the inclusion criteria proposed by this work. Despite being a topic that has been little explored in last 5 years, we noticed that there is a slight tendency to increase the number of publications on the proposed theme.

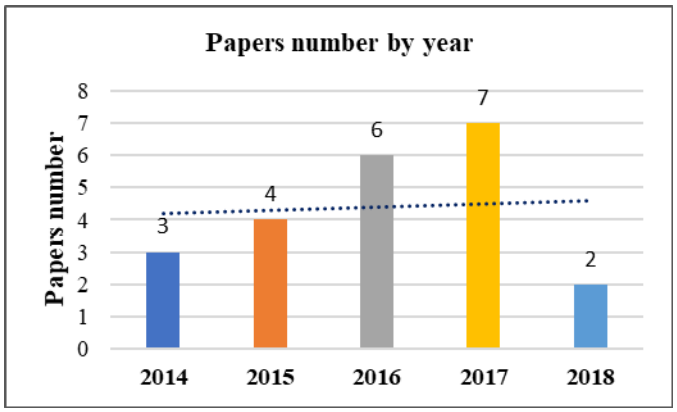

Fig. 2. Number of papers with Trend Line.

B. Researches by Digital Library

For a researcher, it is important to know the digital repository with the largest number of publications in his area of interest. Thus, we list the digital libraries and the works quantity from which the 22 most relevant articles were extracted for this research. The results are shown in Table III.

TABLE III. SEARCH STRINGS APPLIED IN DIGITAL LIBRARIES.

Digital Library	Quantity	Study	Frequency (%)
ACM Digital	1	[32]	4.6
IEEE Xplore	18	[11] [12] [14] [15] [16] [17] [19] [20] [21] [23] [24] [25] [26] [27] [28] [29] [30] [31]	81.8
Scopus	3	[13] [18] [22]	13.6

We noticed that the IEEE Xplore Digital Library, holds in its database the largest quantity of publications on collaborative distance learning in programming or robotics, with 81.8% of selected articles. We emphasize that the libraries ACM Digital Library and Scopus possessed in many articles in the area but not with relevant data for this research.

C. Researches by Events or Journals

As digital repository, it's also important to know the events and journals with the largest number of publications in researcher's area of interest. We list the 22 papers from this research in Table IV, showing the events, journals and the respective quantity.

TABLE IV. RESEARCHES BY EVENTS OR JOURNALS.

Events/Journal	Study	Quantity
IEEE Transactions on Learning Technologies	[1]	1
7th World Engineering Education Forum (WEEF)	[2]	1
Dyna rev.fac.nac.minas	[3]	1
IEEE Latin America Transactions	[4]	1
International Conference on Ubi-media	[5]	1

Computing and Workshops (Ubi-Media)		
IEEE International Conference of Teaching, Assessment and Learning (TALE)	[6]	1
IEEE Symposium on Visual Languages and Human-Centric Computing (VLlHCC)	[7]	1
ACM Conference on Computer Supported Cooperative Work and Social Computing Companion	[8] [12]	2
International Conference on Advanced Science and Engineering (ICOASE)	[9]	1
IEEE IIAI International Congress on Advanced Applied Informatics	[10]	1
International Conference on Knowledge and Smart Technology (KST)	[11]	1
Brazilian Symposium on Software Engineering	[13]	1
International Conference on Advanced Learning Technologies	[14]	1
IEEE Frontiers in Education (FIE) Conference	[15] [16] [20] [21]	4
IEEE Research in Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT)	[17]	1
IEEE International Conference on Contemporary Computing (IC3)	[18]	1
International Conference on Information Society	[19]	1
International Audio Mostly Conference on Augmented and Participatory Sound and Music Experiences	[22]	1

We note that the Frontiers in Education event has the largest number of publications founds for this research. This shows the importance of this event for dissemination of relevant works using STEM approach, Engineering Education and Engineering Learning areas.

D. RQ1: What collaborative activities were developed to promote Collaborative Learning using Groupware?

The activities, papers and number of times they used them, are described in Table V.

TABLE V. ACTIVITIES USED TO ENCOURAGE COLLABORATIVE LEARNING.

Activities	Papers	Number of Papers
Educational Robotic	[11] [16] [19]	3
Video Creation	[12]	1
Java programming exercises	[13] [20] [25] [26] [28] [30] [31] [32]	8
C/C++ programming exercises	[13] [14] [22] [23] [24] [29]	6
Python programming exercises	[16] [17] [32]	3
Games	[15] [23] [27] [28] [30]	5
Linked Lists	[18] [31]	2
Data Mining	[21]	1

We note that activities in Java and C language are the most used to encourage collaboration. Games should also be highlighted, showing that gamification has a strong tendency in collaborative learning. Robotics activities were carried out with Educational Robotics practices.

E. RQ2: What technological resources were employed them to perform collaborative activities?

To know the resources and their characteristics may allow researchers to use them in your future researches. There are several technological tools that favor collaborative learning and among them, we can highlight the use of Artificial Intelligence (AI) in education. Although AI uses were detected in only 4 papers, it has significant contributions to learning in collaborative environments. Table VI shows which technological resources were used in the articles of this research and which used AI.

TABLE VI. TECHNOLOGICAL RESOURCES USED.

Paper	Resources	Description	Uses A.I.?
[11]	RoboKar	Educational mobile robot.	No
[12]	a. Open Source Social Elgg.org b. Web 2.0 platform	a. Open Source Platform that makes it possible to create a Web application. b. Social platform created based on videos.	No
[13]	a. Collece b. Tobii X60	a. Allows to edit, compile and run programs in Java language. b. Used to measure emotions by Eye Tracking.	No
[14]	EVCI	Collaborative Intelligent Virtual Environment	Yes
[15]	xPairtise DPP Environment	Virtual Environment that performs intelligent intervention by the server, through Log analysis.	Yes
[16]	Robô Finch	Low cost robot that allows programming in several programming languages.	No
[17]	Online Python Tutor	Multi-user system for synchronous real-time viewing with chat.	No
[18]	Collab-ChiQat	Intelligent tutoring system with real-time collaboration.	Yes
[19]	RexNet	3D Virtual Reality Unit.	Yes
[20]	Constructivist Multimedia Learning Environment	Virtual learning environment with multimedia resources.	No
[21]	Web Framework	Virtual cooperative learning environment using data mining model for group learning.	No
[22]	Eliph	Web system to evaluate programming in pairs.	No
[23]	Agile Software Development	Tools for rapid software development.	No
[24]	Lina	Online system equipped with creative thinking tools for C++ language.	No
[25]	a. Git b. Bitbucket	a. Distributed version control system, used for software development and has a record editions history. b. Project hosting service.	No
[26]	IDE IDEOL	Virtual collaborative learning environment to perform	No

		programming tasks.	
[27]	Engage	Game-based learning environment.	No
[28]	Github	Source code hosting platform with version control using Git.	No
[29]	Web site	Website created in HTML and CSS for C language programming.	No
[30]	Ruby on Rails	Free framework to increase speed and ease in website development.	No
[31]	a. Bally b. iList c. Ruby on Rails	a. Web-based learning software. b. Tool to help students create a solid connection between code and visual representation.	No
[32]	EarSketch	A virtual programming environment to teach Python and JavaScript coding through song composition and remixing.	No

F. RQ3: What degrees and modalities have Collaborative Learning been applied to?

Recent researches points e-Learning modality has made great progress in education world. This modality has resources that favor remote and collaborative learning and can be easily used in any teaching stage. All papers in this research used this modality, making use of virtual learning environments. As for stages, we must highlight that [17] and [32] did not delimit the participants' degree, only that they were people from 296 cities in 40 countries in [17] case and that they were programmers and musicians in the [32] case. Table VII shows the teaching stages in which the activities were carried out and the percentage rate of this use, based on total 20 works.

TABLE VII. DEGREES IN WHICH RESEARCH WAS CARRIED OUT.

Degree	Papers	Frequency (%)
K-12	[27]	5
High School	[11] [26]	10
University	[12] [13] [14] [15] [16] [18] [19] [20] [21] [22] [23] [24] [25] [28] [29] [30] [31]	80
Postgraduate	[30]	5

It is worth mentioning initially that all educational levels were achieved with collaborative activities. It was clear that the vast majority of research was carried out with higher education students. However, with the spread of Computational Thinking and strengthening of collaborative practices, there may be more research in early degrees in not-too-distant future.

G. RQ4: What Common Methodologies have been applied in use of Collaborative Learning?

Figure 3 shows the Methodologies that were cited in this research selected works. Figure 3 shows the Methodologies that were used in this research selected works. We realized that Collaborative Learning and Collaborative Learning for Pairs were the most used in activities, followed by Problem Based Learning. These results indicate that the activities were carried out collaboratively, with direct interaction between the participants. The resolution of problems and challenges has motivated students in search for learning.

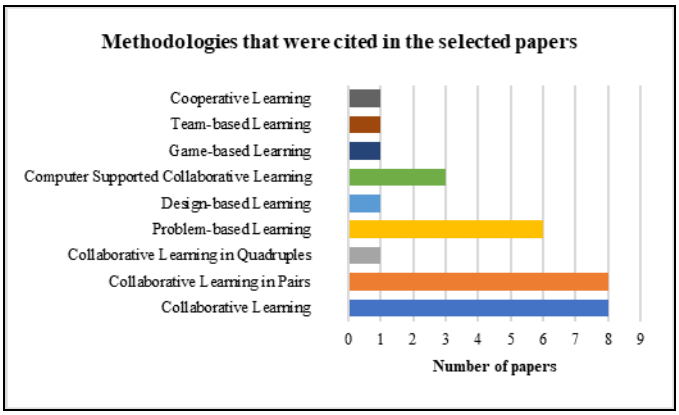

Fig. 3. Methodologies used in selected papers.

H. Q5: What pedagogical concepts were cited in published articles?

Pedagogical concepts are essential in carrying out activities aimed at education, as they facilitate students' learning. They bring a set of techniques and methods that aim to select the most efficient process for the acquisition of knowledge. In this research, only [20] directly cited the use of Piaget's Constructivist conception. However, although the other works did not directly mention the pedagogical bases employed, it was implied that everyone used the Constructivist Theory, as they all applied techniques and methods that allow the student to develop their cognitive skills, collaboratively building knowledge.

I. What do results of published works show?

All works were able to obtain important results through the practical application of collaborative experiments. This shows the researchers' efforts to prove that collaborative learning has significant results in the process of learning programming and robotics using Groupware. The main results reported were summarized in Table VIII, together with the respective goals.

TABLE VIII. MAIN RESULTS CITED IN THE SELECTED PAPERS.

Paper	Goals	Cited Results
[11]	Propose a way to teach and learn more effective programming through an adapted problem-based and object-oriented learning framework.	The framework helped students better understand the introduction to programming. There was cooperation between students when necessary.
[12]	Increase student involvement through reflective processes that include the	1. It is necessary to make teachers and students aware of ongoing activities and group involvement; 2. A video-based social learning platform is able

	video films production.	to stimulate student learning through video creation.
[13]	To assess the usefulness of some of the awareness mechanisms included in a system.	1. Different techniques combination to evaluate interactive systems, such as questionnaires, test techniques, heuristic evaluation, automatic registration and eye tracking. 2. Quality Analysis of a group obtained product, joining process with the result as a problem final solution.
[14]	To assess the efficiency and cost of defect in programming instruments with and without support of an intelligent collaborative virtual environment.	1. Results suggest an equivalence in efficiency and cost in defect detection for the two groups of participants who worked in a virtual collaborative way; 2. Students don't need to be located in the same physical space; 3. Intelligent component, a resource that has been developed to assist the interaction between students during programming learning activities. The intelligent component of this proposal is through a specialized system that allows the equipment to be serviced during the defects identification in a series of instrumented programs.
[15]	To present a professional method of collaborative learning with distributed pairs.	1. Behavioral perception and intervention carried out successfully; 2. Difficulty to implement the process due to the great arbitrary content and ambiguous subject, many factors of interference in behavior complexity.
[16]	To show how robotics can help in teaching Python language.	Survey result showed that mini projects not only stimulate creativity, but also stimulated the ability to solve problems and motivated them to learn Python language.
[17]	To present a multi-user website with a program-based visualization system that allows multiple people to write code together in a collaborative way.	Creation of a multi-user program for computer science education, combining real-time synchronized visualizations with chat, which allows several remote participants to talk about the state of dynamic code execution.
[18]	To show motivation, design and initial Collab-ChiQat prototype implementation.	1. Three categories of learning were evaluated: analysis and problem solving, student knowledge and Collaborative Learning; 2. Structured activities were used, with the virtual environment, and unstructured, in the traditional way. Students reported greater interest in structured version, but found the unstructured version more useful.
[19]	To present a Remote Experimentation Laboratory, called “Building a Remote Experimentation Network" to serve higher education teachers and students in Iraq (REXNet)	1. The 3D virtual reality system has improved the skills and qualifications of teachers and students; 2. Also, the system supported physical laboratories, but did not replace them.
[20]	Design and develop a multimedia constructivist learning environment to improve computer programming skills.	1. Development of constructivist multimedia learning environment; 2. Constructivist multimedia learning through the developed environment was considered more efficient by the participants.
[21]	To select a data mining model to predict student performance in cooperative learning and develop a model for cooperative learning by web, according to the selected data mining model.	1. The results show that the progressive score in using case the model selected for students in group is higher than the progressive score when students are grouped by the coordinators; 2. The model with the best efficiency in research was that which the media used in learning resources facilitates to obtain content of concept. In addition, the Internet's technology model is good and quality. This helps students to obtain new information and knowledge more easily, allowing students to learn on their own.
[22]	Use Eliph, a web-based system, to evaluate pairs in programming, viewing the code history.	1. Code's history helped the evaluator to understand the structure of the code as well as the author's intention more clearly; 2. The feedback quality is higher when the code has been evaluated with code's history; 3. The evaluators found it useful to search code's history for their own learning; 4. During the experiment it was observed that the code authors were unable to estimate whether the pairs correctly understood the code or the intention. This was because most students did not make the level of understanding in the feedback explicit.
[23]	Empirically compare collaborative practices influence on two essential aspects of skill acquisition: motivation and learning.	1. Collaborative practices uses are very promising for skills acquisition in programming; 2. Programming tasks helped the audience to feel confident in learning.
[24]	To investigate whether a collaborative programming environment can promote student creativity.	There was a significant difference in ideas number created in two groups, an experimental and a control group, with the experimental group having better ideas in the categories and originalities.
[25]	To investigate whether student involvement in collaborative development efforts contributes to the process of learning software development practices and techniques.	1. The methodology created a better team environment, allowing for better discussions and ideas to be shared and implemented; 2. Helped team members to solve problems more easily than alone; 3. Increased learning curve in programming languages.
[26]	Applying a collaborative IDE to investigate whether IDEOL's use facilitated learning programming object.	1. IDEOL environment facilitated collaboration between students and instructors; 2. Students were satisfied with IDEOL and collaborative experience.
[27]	To present evidence that a collaborative gameplay approach can solve problems for students with less gaming experience and	1. Men took advantage at first; 2. After the intervention, there was a balance in learning.

	improve gender diversity in Computer Science activities.	
[28]	Application of an academic project for software development in a collaborative environment.	1. Organization of collaborative programming activities individually and in groups of 2 and 4 participants; 2. Assessment and detection/resolution of conflicts in simultaneous activities.
[29]	To show a set of learning objects to assist in teaching programming.	1. There was a good collaboration between the students with activities virtual learning environment. 2. The objects fulfilled the helping goal students during problems execution.
[30]	To present a structure for classroom programming exercises carried out by students' dyads whose activity was mediated by an online learning platform.	It showed that students were actively engaged through the consideration, comparison and negotiation of alternative points of view for an exercise.
[31]	To explore the collaboration usefulness in a web-based software for first-year computer science students.	1. Increase in confidence in partner; 2. Faster responses; 3. Individual participants responded faster, but made more mistakes; 4. Considering the time to complete and correct the task, the collaborative participants were more efficient.
[32]	To explore live coding of collaborative music using coding environment and pedagogical tool EarSketch.	1. Chat's use is an important element in collaboration; 2. A hybrid chart form with multiple script editing can perform more interestingly in the result; 3. Conversations and coding collaborates in real time with groups of two, three or more participants, can be very useful in classroom for educational purposes.

An essential feature of Groupware approach is that it allows collaboration between geographically distant participants, so synchronous or asynchronous. Among the works listed, we highlight Guo et al. [17] who presented a collaborative environment for working with Python language data structures. The authors reported that they managed to involve people from 296 cities, from 40 countries, in programming activities. Participants were able to write code together in a collaborative, synchronous and asynchronous manner. They completed the proposed challenges, showing that collaborative learning through Groupware works efficiently.

It was also highlighted a research conducted by Salah et al. [19], using the teaching of robotics in a synchronous collaborative way in a remote laboratory. Collaborative learning has improved the skills and qualifications of teachers and students who participated in proposed activities. An intelligent agent was employed to assist during the tasks. This show artificial intelligence can positively contribute to educational process.

V. CONCLUSIONS

This research full paper aimed to investigate state of the art on collaborative learning, employed through Groupware. For this purpose, was realized a Systematic Review of Literature. We emphasize that this research was carried out with intention of gathering information to help researchers on the proposed theme. Criteria were applied to include relevant works for this purpose. From the number of collected papers, we realize that there is still little specific research on this topic, but that it has been growing gradually in recent years.

Employing Collaborative Learning made a difference in studies, because improved knowledge acquisition to students, even if they are geographically distant. Collaborative Learning allowed students to learn more efficiently and in all cases, there was a significant improvement in their skills, proving to be good tools for pedagogical support.

Technological works tools mentioned showed the great diversity of functional resources available, each trying to reach an audience with specific characteristics. However, there are still many realities to be achieved by Collaborative Learning at a distance, showing that much can still be produced in this context, to creating or improving existing Groupware in educational scenario.

Papers in this research showed that even remotely distant, students have managed to develop skills in programming, robotics and even in both areas. This proves the efficiency of collaborative learning through groupware, which can produce good results among participants.

This study was conducted on the main digital libraries of Informatics in Education, being was restricted to ACM Digital, IEEE Xplore and Scopus libraries. As the publications were limited in 2014-2018 period, if that period were expanded, other publications would include and we could have results even different from those found. As suggestion for future works, a longer time interval can be used to collect papers.

As previously discussed, there is a need to compare the efficiency of collaborative practices, as its application in education has been shown to be increasingly important. For future works, we suggest to deepen studies on these practices, mainly in Educational Robotics area, given that the research's number in this area it's smaller than in programming area.

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