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Analysis of CSCL Chats for Cognitive Assessment and Individual Participations

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Abstract: Computer Supported Collaborative Learning (CSCL) provides the possibility of learning through collaborative interaction, and the social construction of knowledge through the utilization of information technology (IT). It contains several tools that allow learners to participate and interact in a virtual environment. Chat is one of the most effective tools in CSCL owing to the accessibility and ease of its use by learners. It is also one of the best methods used in learning discussions. However, there are a few tools that help teachers evaluate students' chats. Due to this difficulty, chats are rarely used in the formal learning context. To remedy this problem, this paper provides a model that enables teachers to automatically assess cognition and individual participations in chats. With regards to the cognitive assessment, a test will be utilized. The test contains a set of questions that students were asked to pose about the threads they will discuss. Then, these questions were put in a database to be answered by the students after discussions. Accordingly, the cognitive assessment of the students will be evaluated through results obtained from the test. As for the assessment of individual participations, chats will be analyzed using Trausan-Matu's polyphonic model based on Bakhtin's ideas, in order to obtain the most frequent words for each participant and their inter-relations. Obtaining results in the form of graphics and statistical tables helps teachers to know the results of cognitive assessment and relate them to the individual participations of each student. The aim is to reach rational findings that link the individual participations, namely the students' behavior in their dialogs within the chat, and the results of cognitive assessment resulting from the test given to the students at the end of the chat. In sum, the system offers a general perception of the assessment that is more effective and able to measure the level of collaborative learning in CSCL chats. From these results, teachers can easily assess the learning dialogs, in order to assess the students' cognition of the threads discussed. By doing so, this would help teachers to develop learning strategies that are capable of reaching an effective collaborative learning dialog.

Keywords: Computer Supported Collaborative Learning; Chat, Cognitive Assessment, Individual Participations, Polyphonic Model, Natural Language Processing, E-learning.

1. INTRODUCTION

Computer Supported Collaborative Learning (CSCL) is an important paradigm that uses information technology tools that help learning processes [1]. It also uses many supporting technical tools in collaborative learning, and provides the environment for learners to discuss and share their ideas effectively. To stimulate social collaborative interaction among learners, they are often engaged in virtual learning groups that simulate the traditional learning groups [2] [3]. CSCL provides tools that facilitate the exchange of information and display the instructional materials using multimedia, through which learners can easily understand the instructional threads, learning becoming more interesting and effective than the traditional one [4]. Accordingly, CSCL attempts to transform learning in terms of knowledge transfer and interpretation of lessons from a teacher-centered system into a system that helps learners manage instructional dialogs and exchange of views, in which the learner contributes to build and impart knowledge to the rest of his or her peers. In sum, the role of the teacher is to mentor and participate in improving learning strategies when needed [5].

CSCL is considered of great importance for students to increase their mental abilities and develop their learning skills in interpreting the instructional threads in a simplified manner. In addition, it promotes the students' explorative learning through the mastery of dialog skills. This leads to empowering students to be capable of relying more on themselves in the transfer and exchange of knowledge. As a result, learning becomes participatory and collaborative [6].

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Chat is one of the best and most popular tools used for knowledge building and transfer in CSCL [7], in which learners are placed in a virtual technical framework that is very similar to classrooms. It also provides learners with an opportunity to express and discuss their points of view through instructional dialogs, but this is subject to synchronous contact. Chat effectively helps to develop students' learning skills in raising their knowledge building and transfer skills. Chat also contributes to the creation of a collaborative learning environment that realizes the collaboration to discuss education subjects. Collaboration in educational dialogs is realized by involving all students in a coordinated effort to discuss a school subject or solve a problem together [8-10].

The CSCL environment with all its tools helps the development of e-learning to become a qualitative addition in the field of collaborative learning. Chat as an important tool in CSCL helps to develop students' skills, such as dialog skills, problem solving, exploration, planning, collaboration, acceptance of opinions and other skills that must be available in the learning environment [11]. Besides, it helps students focus also on the concept of self-learning, i.e. creating an appropriate learning environment for students to highlight their self-management skills and self-reliance in explaining school subjects, and participate in the transfer of knowledge and problem solving [12]. In general, chat attempts to integrate students with higher mental abilities with students with low abilities to help them understand and simplify the school subjects [13].

Assessing the cognitive outcomes in the discussions of CSCL chat is considered difficult and complex for many reasons, including the lack of an effective technical mechanism capable of analyzing chats, in order to draw logical conclusions, which would enable teachers to evaluate the learning groups effectively [14-16]. Consequently, it became necessary to have effective technical tools that are capable of analyzing the individual participations of interlocutors. The latter is considered an effective part of analyzing CSCL chats in general, in order to obtain logical conclusions that can be studied and analyzed. This paper demonstrates a new addition to assessing the student's cognitive aspect through the utilization of tests and the analysis of individual participations in the CSCL chats. This aims to obtain results through which the effectiveness of collaborative learning can be assessed. To do so, we used tests that contain a set of questions posed by students. Students will be asked to pose a set of questions about the threads they will discuss. These questions will be inserted in a database and they will constitute a quick test for students at the end of the chat, allowing obtaining results that measure and evaluating students in a CSCL chat.

In this paper, the first section presented the proposed mechanism for the cognitive assessment of CSCL chats. The second and third sections clarify the concept of tests and their integration as a mechanism for assessing students in CSCL chats. The Fourth section describes the analysis and assessment of chat and the main features of the tools used in the analysis. The Fifth section discusses the results of the learning groups derived from the cognitive assessment and the assessment of individual participations. Finally, this paper ends with conclusions and references.

2. CSCL CHAT AND TESTS

CSCL is one of the most promising innovations to improve teaching and learning with the aid of modern ICT tools. It is also one of the most important computer-supported learning fields that improve learning and employ collaborative work to enable learners to discuss their ideas and present their views, allowing the exchange of ideas and information. CSCL is interested in the various views related to the subject of learning [17]. Besides, CSCL can be defined as one of the e-learning paradigms based on the social interaction among learners, as they work in small groups that share the task, or achieve common learning goals through group activities in a coordinated effort, using various services and tools across the web. By doing so, CSCL focuses on generating knowledge rather than receiving it. As a result, learning is transformed from a system that focuses on the teacher as the one who plays the major role in knowledge transfer into a system that focuses on the learner and makes the teacher only a mentor and participant [18].

The CSCL environments contain a number of different technical tools, which are designed to facilitate collaboration and activate teaching and learning. These tools include multimedia, experimental simulation, chat, and presentations. These tools help to promote collaboration among students [19]. Chat is one of the most important and most effective tools used in the CSCL environment [7]. It is a tool for achieving the principle of collaboration, which allows students to express their ideas and views through educational dialogs realized by creating virtual learning groups to facilitate the exchange of views among students. On the other hand, it helps students pursue their learning activities together and significantly contributes to encouraging students' mutual thinking. Moreover, collaboration is perceived in the chat by engaging students in a coordinated effort to solve a problem together [20].

However, CSCL environments do not contain effective tools that can assess learning chats. The assessment can be a cognitive assessment or an assessment of the individual participations, evidenced by student discussions in a chat. The proposed system seeks to draw logical conclusions automatically, through which teachers can evaluate the effectiveness of learning groups, as well as monitoring the effectiveness of dialogs to achieve successful collaborative learning. As a result, it has become necessary to find effective technical tools capable of analyzing the individual participations of

interlocutors, which are considered an effective part of analyzing chats in CSCL [21, 22].

The successful assessment of the student is to integrate the test results with the evaluation of the student's activities within the instructional dialogs, and hence we can obtain more accurate results about the student's participation in collaborative learning. From these results, teachers can know what their students' abilities are, and it allows them to intervene in order to find teaching strategies that improve the level of their students. Thus, the teacher can obtain a general perception of the student's abilities in the collaborative learning, namely the test results and the results of individual participations in the CSCL chats [23, 24].

A test is a measuring tool through which the student is examined to verify whether he or she has mastered the material or skill he or she has acquired the following steps and conditions [25]. Tests are considered of great instructional importance. It is not only important in determining the student's capabilities, but also as an important tool for learning. Tests are one of the most important tools used by the teacher to verify whether the student has acquired the information by answering specific questions [26]. Testing is one of the best techniques used to evaluate a student, although there are other techniques, such as measuring the student's interaction within the classroom [27].

Test results provide the teacher with an overview of the student' knowledge, thus it helps the teacher to review the instructional plans and strategies. In addition, it helps teachers make decisions that are beneficial in the teaching process. Tests allow the exchange of information about the student between the teacher and the parents, in order to identify the strengths and weaknesses and to elaborate on the developmental and remedial mechanisms for students. In addition, it provides the possibility of using tests to measure the effectiveness of teaching and its impact on the students' learning.

Tests are considered an important means of measuring and evaluating the students' abilities and their level of academic achievement. On the other hand, it also measures the extent to which the behavioral goals or the educational outcomes are achieved. Besides, it examines the extent to which the various instructional activities offered by the teacher contribute to raising the students' achievement skills [28].

Tests have a lot of importance and benefits, including [29]:

1. All types of tests encourage students to study and to work hard to achieve good scores;

2. It encourages students to establish continuous contact with their lessons;

3. It makes the student fully prepared to understand and study the school subjects, as the student has to revise and study the material to be learned prior to the test;

4. Tests make the student gain activity, vitality, and perseverance;

5. Tests allow the student to identify the aspects of shortcomings and deficiencies, thereby remedying it by increasing the daily hours of studying and focusing more on his study;

6. Finally, tests are the means to evaluate a student and its notes are evidence of his diligence or failure to study;

Tests are considered one of the assessment tools that can determine the extent to which the student has acquired information and skills. However, they cannot sufficiently verify the student's true level owing to the circumstances for the accomplishment of these tests. Sometimes, tests coincide with the time when the student is unready, psychologically unprepared, or affected by factors of external pressure. In addition, the test measures the student's ability to retrieve information ignoring the measurement of the student's activity in the instructional dialogs [28, 12]. Therefore, this research seeks to link the assessment of individual participations reflecting the student's behavior during their discussions in CSCL chats with the cognitive assessment. As result, the assessment results will be more comprehensive and accurate due to the use of two assessment factors: the cognitive assessment used to measure the students' knowledge and the assessment of the student's participations in the chat.

3. COGNITIVE AND INDIVIDUAL ASSESSMENT FOR CSCL CHATS

In this paper, semi-structured interviews were conducted with a number of educational experts and CSCL experts, so that these interviews allow defining the steps and a model for cognitive assessment and individual participation, and the mechanism for incorporating them into the analysis of CSCL chat, in order to obtain the results that can be analyzed.

It also presents a new method to assess the student based on two aspects: the cognitive aspect through the tests, and the skill aspect through the individual participations in instructional dialogs. It also seeks to create a system capable of analyzing the contents of the students' chats and automatically obtain results for the individual participations and test in the form of graphics and statistical tables. This system will help teachers know the results of cognitive assessment and relate them to each student's individual participations, in order to obtain logical conclusions that link the individual participations, namely the student's behavior in their dialogs within the chat, with the results of the cognitive assessment resulting

from testing students at the end of the chat. In sum, the system provides a general perception of the assessment that is more effective and capable of measuring the level of collaborative learning in CSCL chats.

In this paper, we add a new feature to the analysis system of individual and collaborative participations in the CSCL chats. This is performed by the students' cognitive assessment, which is realized by asking each participant in the chat to talk about a specific thread, previously determined by the teacher, and then asking each participant to pose a set of questions related to the threads to be discussed. As a consequence, we will have a database that contains a set of questions for all the threads that will be discussed within the chat groups. At the end of the discussions, each student undergoes an evaluation test. The test results are then compared with the results of individual participations in the form of statistical tables and graphics, through which teachers can indicate the students' general results derived from the cognitive assessment and skill assessment. Besides, it allows to effectively assessment the learning groups in order to achieve successful collaborative learning, which is able to focus on the students 'cognitive skills, namely measuring the extent of their ability to memorize the information, as well as measuring the students' collaborative skills, which are measured by the extent of their participation and interaction within the learning group [30-32].

As for the assessment of individual participations, the system relies on the assessment of individual participations through the mechanism of identifying the important threads discussed by each participant in the chat, based on Bakhtin's [33,34] ideas and Trausan-Matu's polyphonic model [3,35,36], in order to obtain the most frequent content words/concepts/threads and their inter-relations/inter-animations for each participant. Bakhtin's ideas were applied in Trausan-Matu's polyphonic model. The system focused on analyzing the content of the chat using natural language processing techniques. The aim was to obtain the most frequent words, which easily refer to the important concepts, which form threads discussed in the chat. Trausan-Matu's polyphonic model was effectively utilized in developing CSCL tools [13, 14].

The assessment of individual participations generally indicates the extent to which the interlocutor contributes to the chat, in order to clarify his or her own personal viewpoint and present his or her ideas to others by addressing them. Using Trausan-Matu's polyphonic model, key ideas have been identified through the repetition of words in the chat. This is a key indicator of the individual participations for each participant and the possibility of its assessment.

4. RESEARCH DESIGN

A study was conducted at Al Noor International School, and the number of participants was 5 students, from 12th graders, who study computer subject, and a single conversation group was created, allowing only five students, and the topics that students will discuss in advance have been identified (C #, JAVA, Python, Visual Basic, and C++).

In general, the study took about two hours to implement and was distributed as follows:

1- 15 minutes to introduce students to the conversation group.

2- 60 minutes per student to study and prepare the topic that has been identified, in addition to writing test questions for each topic.

3-30 minutes chat time for conversation.

4-15 minutes the duration of the test.

The study consists of several phases:

Phase 1: creating a conversation group, and defining the topics that each student will discuss.

Phase 2: studying the topics, and ask each student to write the test questions in the topic they will discuss, and be limited to the form of multiple-choice or True/False, with the answer key.

Phase 3: after completing a chat, each student will undergo a test of the topics discussed in CSCL chat.

Phase 4: assessment of results and providing feedback.

5. CHATS ANALYSIS

This section will explain the mechanism of chat analysis in the proposed model. Figure 1 shows the main components of chat analysis, which are the following:

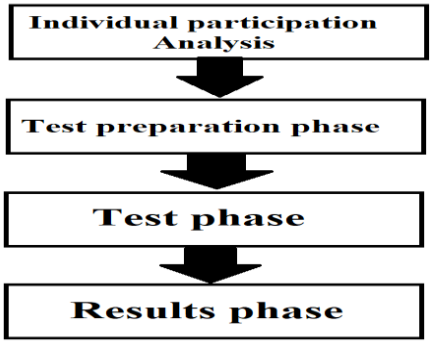

Figure 1. Chat analysis system components.

1. Test preparation phase: This is usually performed prior to commencing a chat. Each student is asked to put a set of questions related to the thread specified by the teacher. The questions should be clear and understandable. The form of these questions is determined (true/false questions, multiple choices questions). The teacher re-evaluates the questions and rephrases them if necessary, and then randomly distributed them as test forms, in order to give them to

students at the end of the chat for answering them. A database that contains the set of questions put by the students is created.

The aim of students' placement of the test questions is to activate the role of the student in the CSCL chats as the main focus in the process of knowledge building and transfer and sharing of views. In addition, the student focuses on the basic concepts either directly or indirectly, because he or she previously knows that there exists a test containing questions developed by them. The overall goal is to encourage students to administer their discussions, and to give students confidence in themselves within the collaborative learning environment.

2. The phase of chat analysis for the individual participations: At this phase, the chat is done and analyzed by NLP techniques (tokenization, stemming and lemmatization, and stop words removal). We used Stanford NLP tools (http://nlp.stanford.edu) in order to extract the most frequent words, through which we can identify the most important threads discussed in the chat, according to Trausan-Matu's polyphonic model based on Bakhtin's ideas. The goal is to obtain the individual participations of the students in CSCL chat.

3. Test phase: At this phase, each student passes an electronic test, and the time for the test is set and determined according to the nature of the threads discussed in the chat.

4. Results phase: The results of individual participations indicate the student's contribution to the chat. These results are expressed in the form of statistical tables and graphics that show the student's repetition of the threads discussed, through which the individual participations can be assessed. In addition to the results of the test, the results show the percentage of the student's answers to all subjects and the total result of the test. The test results are then linked to the individual participations. As a result, teachers have a general assessment of the CSCL chats.

6. DISCUSSION

This paper is based on chats performed by a group of students from Al Noor International School, which are then analyzed and the results are discussed. These chats are learning sessions with more than one participant discussing predetermined threads, such as debating about the pros and cons of some programming languages. In such a chat, each participant is assigned to focus on a particular thread to discuss it with the rest of his or her peers. The threads are as follows: C#, JAVA, Python, Visual Basic, and C++.

For example, in the chat analysed in the rest of the paper, threads were distributed to the participants as follows: The first participant was assigned to focus on the thread of JAVA; the second participant focuses on C#, the third participant focuses on C++, the fourth participant focuses on Python, the fifth participant focuses on Visual Basic.

Table 1 shows a part of the chat. Each chat utterance contains several parts: the first section is the intervention number, the second section is the participant's name, and the third section is the intervention (utterance). As for the last section, it is the reference, which means the number of one of the participants uses a previous intervention to complete the discussion, information, or a reply. The reference shall be clarified to have a comprehensive and coherent dialog, through which collaborative learning is shown in the chats.

TABLE 1 .A PART OF THE CHAT.

16	participant 3- C++	Programming is important to create software and applications that help computer and mobile users in daily life.	**12**	participant 2- C#	What is the importance of programming languages in our lives?
17	participant 1- JAVA	Hi everyone, I'll talk about Java.	**6**	participant 4- Python	Please, each participant tells us about the subject he wants to discuss, for me I will speak about Python.
18	participant 2- C#	A program is a group of logical, mathematical, systematical and managed functions grouped together to perform a specific task.	**-1**		
19	participant 3- C++	I just recently joined the world of programming. What I've found to be true is the idea that programming in it's simplest form is really just problem solving.	**12**	participant 2- C#	

20	participant 4- Python	To be a good programmer, you have to be able look at a large problem, and break it down into smaller more manageable problems. It's as if you were putting together a very large puzzle	**19**	participant 3- C++	I just recently joined the world of programming

The most frequent words (excluding non-content words such as "the", "a", "an", etc.) that have been extracted after analyzing the chat are the following: C #, JAVA, Python, Visual Basic, and C++.

Accordingly, the system will deal with these words as the main threads/concepts discussed in the chat. Through these words, the individual participations of the participants will be evaluated.

TABLE 2. THE RESULT OF THE CHAT ANALYSIS.

Al Noor International School								
Participant involvement and interaction			Threads in chat					
Participant Name	No. Interventions	No. Reference	Java	C#	C++	Python	Visual Basic	Total
Participant 1(Java)	120	98	19	20	17	8	9	73
Participant 2(C#)	94	87	5	8	7	4	8	32
Participant 3 (C++)	80	76	9	2	17	3	1	32
Participant 4 (Python)	35	32	5	2	6	4	2	19
Participant 5 (Visual Basic)	89	40	6	4	12	0	7	29
Total	418	333	44	36	59	19	27	185

Table 2 shows the result of the chat analysis, containing a column for the participant's name, a column for the number of interventions, and a column for the number of references. There is also a number of columns for the most frequent threads, which indicate the most important concepts discussed in the chat, and show the number of threads frequency per participant. For example, Participant no. 1 has 120 interventions, 98 references, and the numbers of appearances of main threads in the interventions are: Java = 19, C# =20, Python = 8, Visual Basic = 9 and C++ = 17.

Table 3 shows a part of the questions posed by the participants about the threads discussed in the chat. and the types of test questions were determined as multiple-choice questions and true/ false questions. The questions should be clear and within the instructional plan of the chat. In addition, the teacher can modify or add to the questions, as well as it is possible to estimate the test time.

TABLE 3. PART OF THE QUESTIONS WAS WRITTEN BY THE PARTICIPANTS.

Participants Name	True /False Questions	Multiple Choice Questions
Participant 1 (Java)	11- Can the program be designed by more than one programmer?	12- Which statement is not true in java language? (a) A public member of a class can be accessed in all the packages. (b) A private member of a class cannot be accessed by the methods of the same class. (c) A private member of a class cannot be accessed from its derived class. (d) A protected member of a class can be accessed from its derived class. (e) None of the above.
Participant 1 (Java)	13- Is there a difference between JDK, JRE and JVM?	14-To prevent any method from overriding, we declare the method as, (a) static (b) const (c) final (d) abstract (e) none of the above
Participant 1 (Java)		15- Mark the incorrect statement from the following: (a) Java is a fully object oriented language with strong support for proper software engineering techniques (b) In java it is not easy to write C-like so called procedural programs (c) In java language objects have to be manipulated (d) In java language error processing is built into the language (e) Java is not a language for internet programming.

The test is one of the most important tools of the cognitive assessment [32]. This research concentrates on encouraging students to lead the learning process, as well as the possibility of discussing learning threads and developing test questions for the threads discussed. It also seeks to achieve a successful learning environment that learners are the central axis of the learning process. Besides, it aims to make the role of the teacher only mentoring and to develop plans and strategies that help to reach a successful learning environment. The test results help the teacher evaluate the information acquired by the student, and thus help the teacher reconsider the learning plans and strategy. By doing so, it allows the teacher to make decisions that help raise the levels of students in administering the learning dialogs.

Table 4 shows the test results of Chat No. 1 for the Al-Noor International School. It presents the results of participants' answers based on each thread discussed in the chat. The test was conducted at the end of the dialog, by displaying the test's screen. The participants were asked to pass the test. The test consisted of 20 questions that included all threads discussed, except the thread assigned for discussion to the participant passing the test.

For example, Participant no. 1 gets the test questions for all threads except the questions related to the Java thread. The reason behind this is to apply justice in the test, as the participant has a prior knowledge of the test questions related to his or her thread. Besides, there is the timing of the test. From these results, there exist some indicators that can serve as a basis for the cognitive assessment. We can conclude several things from the results' table, including the final mark for each student, through which the best and weakest participants can be identified. For example, Participant no. 1 has scored an excellent mark in the test, and this indicates that the participant has a high level of understanding. Accordingly, the cognitive assessment of the participants is performed effectively. Participant no. 2 obtained Java=5, C++=5, Python=3, Visual Basic=3, which indicates that this participant has scored high marks on the C++ and Java thread. This indicates that Participants 1 and 2 were able to explain well the thread they have discussed, enabling the others to obtain good results.

TABLE 4. THE TEST RESULTS OF CHAT NO. 1.

Al Noor International School						
Participant Name	**Java**	**C#**	**C++**	**Python**	**Visual Basic**	**Grade**
Participant 1(**Java**)		5	5	3	4	**4.25**
Participant 2(**C#**)	5		5	3	3	**4**
Participant 3 (**C++**)	5	5		2	3	**3.75**
Participant 4 (**Python**)	4	3	2		2	**2.75**
Participant 5 (**Visual Basic**)	4	4	3	1		**3**
Rate	**4.5**	**4.25**	**3.75**	**2.25**	**3**	

Table 4 also shows the results for each thread. For example, most of the participants scored a high percentage in the Java and C# threads, which indicated that Participant no. 1 and Participant no. 2 performed a good job in delivering the information and explaining the threads well. Consequently, most of the participants managed to answer the test questions and get high marks. In the Python thread, most of the students have low marks, which indicated that Participant no. 4 has not explained his or her thread in an understandable way that the rest of the participants can understand the topic well. The teacher can also get an effective cognitive assessment through the test results. The teacher can also develop remedial plans that help raise the level of Participant no. 4, and motivate the rest of the participants to raise their learning level. The successful cognitive assessment helps to develop collaborative learning so that participants have the confidence to conduct learning dialogs and share knowledge effectively.

Figure 2 shows the graph of test results that helps teachers and participants learn and compare results.

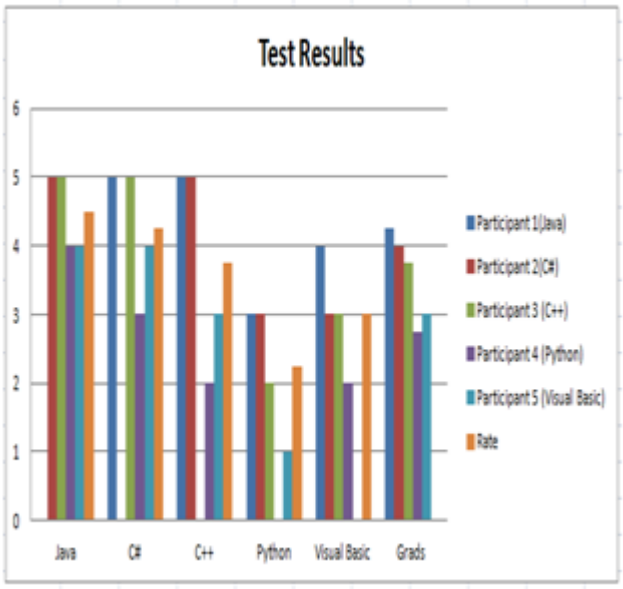

Figure 2. Test Results.

With regards to the individual participations and their relation to test results, the assessment of individual participations in CSCL chat sessions was conducted by analyzing the chat and getting the most frequent words per participant. When comparing the results of individual participations with the test results, the teacher has the overall assessment of the chat, through which he gets a high degree of accuracy in the chat assessment. Figure 3 shows the results of individual participations and tests. The individual participations indicate that Participant no. 5 has the least frequency for the Python thread. This indicates that he has weak participation compared with the rest of the participants. We can correlate this with the test result that most students have not scored high marks in the thread of Python discussed by Participant no. 5. As for Participant no. 5, he has a large number of individual participations in the chat. Comparing the results of the students' test in the Java thread, and that all the participants have scored high marks indicate that the behavior of Participant no. 1 was active during the chat and that he tried very much to raise the thread and discuss it extensively. By doing so, Participant no. 1 has helped the participants to understand the thread and answer all the questions that have been posted about the thread successfully.

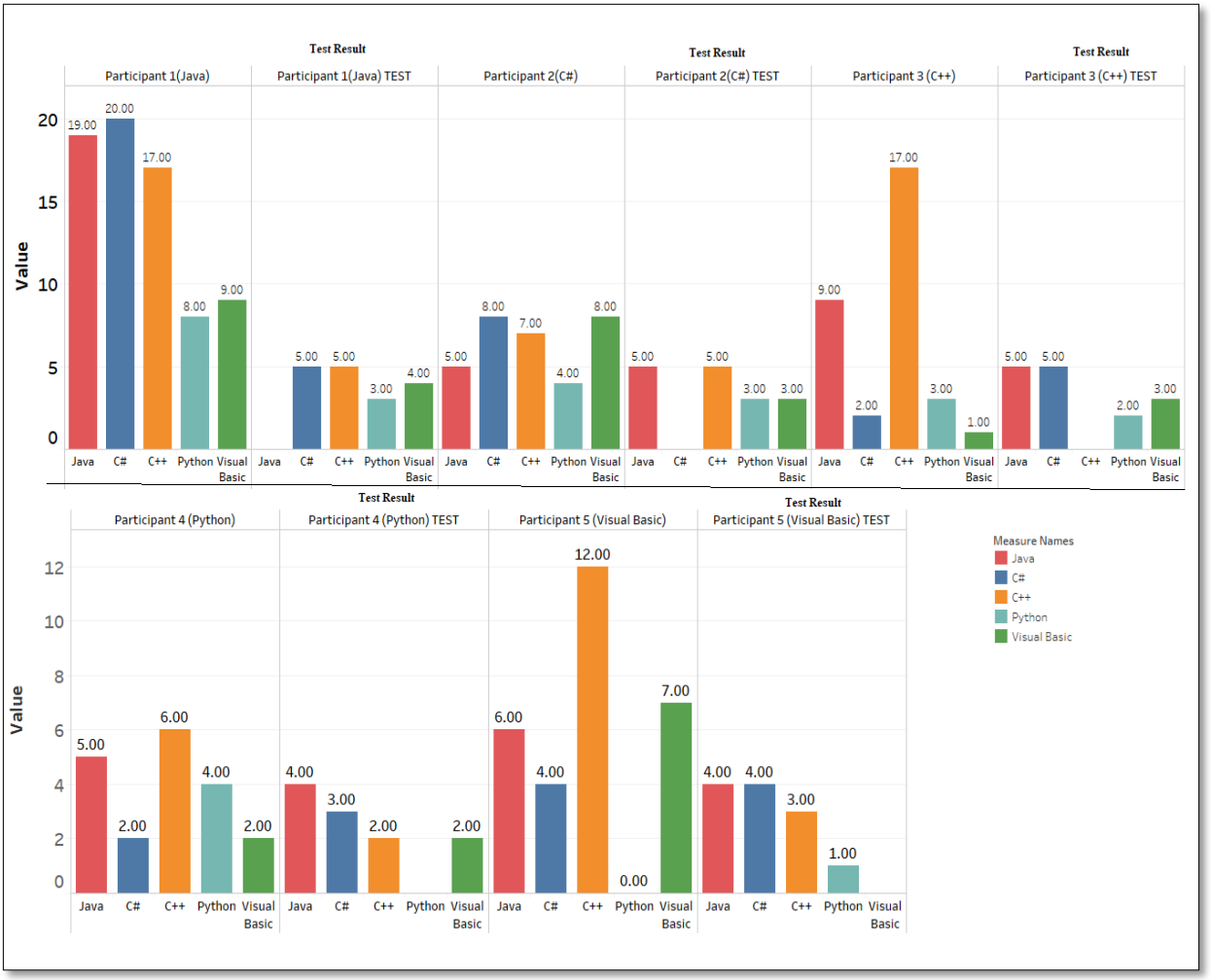

Figure 3. The results of individual participations and tests.

7. Conclusion and Future Work

The proposed system in this paper seeks to provide a model for a technical tool capable of automatically analyzing CSCL chats for the cognitive assessment of the students using a test that contains a set of questions. These questions are developed by all the students involved in the chat. The teaching mechanism adopted in this system is to give each participant a specific thread in order to make an effort to explain it in the CSCL chat. Getting results in the form of graphics and statistical tables allows teachers to perform a cognitive assessment easily and more effectively. The teacher can also link the test results with the individual participations of the students, so that the cognitive assessment becomes more accurate through studying the cognitive assessment and the behaviour of the students during their discussions to the threads, namely the assessment of individual participations. In general, the results offered by the system allow the teachers to develop strategies capable of encouraging the students in administering the learning dialogs and promoting the collaborative learning, in which the student is the main basis in knowledge transfer and exchange. By doing so, this will reflect on the students' behavior inside the learning groups. They will become able to rely on themselves in administering the discussions in the CSCL chats.

In the future, the overall result of the chat test can help to compare the chat with more than one chat. Hence, the cognitive assessment of all CSCL chats can be assessed and results obtained can be studied. This allows teachers to identify the best scientific sessions and thus encourage them. On the other side, the weak dialog sessions will serve as feedback, through which teachers can develop remedial plans to help raise the levels of participants.

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REFERENCES

[1] Allaymoun, H.M., (2014). Analysis of Discourse Threading and Inter-animation in CSCL Chats, Proceedings of the 10th International Scientific Conference eLearning and software for Education, Bucharest. Romania.

[2] Stahl, G. (2006). Group cognition. Computer support for building collaborative knowledge. Cambridge: MIT Press.

[3] Trausan-Matu, S., (2010). The Polyphonic Model of Hybrid and Collaborative Learning, In Wang, F.,L., Fong., J., Kwan, R.C., Handbook of Research on Hybrid Learning Models: Advanced Tools, Technologies, and Applications, Information Science Publishing, Hershey, New York, pp 466-486.

[4] Thorsten Hampel and Reinhard Keil-Slawik,. (2003). Experience with Teaching and Learning in Cooperative Knowledge areas. Technical report, University of Paderborn and Heinz Nixdorf Institut.http://www2003.org/cdrom/papers/alternate/P136/p8-hampel.html.

[5] Berland, M., Davis, D., & Smith, C. P. (2015). AMOEBA: Designing for collaboration in computer science classrooms through live learning analytics. International Journal of Computer-Supported Collaborative Learning, 10(4), 425–447.

[6] Ludvigsen, S., & Arnseth, H. A. (2017). Computer-supported collaborative learning. In E. Duval, M. Sharples, & R. Sutherland (Eds.), Technology enhanced learning (pp. 47–58). Cham: Springer International.

[7] Marttunen, M. and Laurinen, L. (2007). Collaborative learning through chat discussions and argument diagrams in secondary school. Journal of Research on Technology in Education 40 (1), 109–126.

[8] Stahl, G., Wee, J. D., & Looi, C.-K. (2007). Using chat, whiteboard and wiki to support knowledge building. Paper presented at the International Conference on Computers in Education (ICCE 07). Hiroshima, Japan. Web: http://GerryStahl.net/pub/icce07.pdf.

[9] Fuks, H., Pimentel, M., & Pereira de Lucena, C. (2006). R-u-typing-2-me? Evolving a chat tool to increase understanding in learning activities. International Journal of Computer-Supported Collaborative Learning, 1(1), 117-142 Doi: http://dx.doi.org/10.1007/s11412-006-6845-3.

[10] Çakır, M. P., Zemel, A., & Stahl, G. (2009). The joint organization of interaction within a multimodal CSCL medium. International Journal of Computer-Essays in Computer-Supported Collaborative Learning Supported Collaborative Learning, 4(2), 115-149. Web:http://GerryStahl.net/pub/ijCSCL_4_2_1.pdf Doi: http://dx.doi.org/10.1007/s11412-009-9061-0.

[11] Stahl, G. (2017).Essays In Computer-Supported Collaborative Learning, illustrated Publisher Lulu.com, 2017, ISBN: 1329859561, 9781329859562.

[12] Wiggins, G. (1998). Educative assessment: designing assessments to inform and improve student performance. San Francisco, CA: Jossey-Bass.

[13] Allaymoun, H.M, Trausan-Matu, S. (2016). Analysis of the Altruistic Dimension of CSCL Chats, Proceedings of the 12th International Scientific Conference eLearning and software for Education, Bucharest, Romania , 166-173.

[14] Allaymoun, H.M, Trausan-Matu, S. (2016). Analysis of Collaboration in CSCL Chat Using Rhetorical Schemas, Proceedings of the 19th IEEE International Conference on Information and Communication Systems, Irbid, Jordan.

[15] Fitch, P, Steinke, P, and Hudson, T. 2013. Research and youroret perspectives on cognitive outcomes of service learning. In P. H. Clayton, R.G. Bringle, & J.A. Hatcher (Eds.), Research on service learning: Conceptual framework and assessment, Vol. 2A: Students and faculty members (pp. 57-83). Sterling, VA: Stylus.

[16] Davis, Mark A. and Curtis, Mary B.; Tschetter, Jeffrey D. (2003).Evaluating Cognitive Training Outcomes: Validity and Utility of Structural Knowledge Assessment.Journal of Business & Psychology. Winter2003, Vol. 18 Issue 2, p191-206. 16p.

[17] Stahl, G., Koschmann, T., and Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In R. K. Sawyer (Ed.), Cambridge handbook of the learning sciences, 409-426. Cambridge, UK: Cambridge University Press. Retrieved July 30, 2010 from: http://www.cis.drexel.edu/faculty/gerry/cscl/CSCL_English.pdf.

[18] Edman and Elaina. (2010). Implementation of formative assessment in the classroom. A thesis submitted to fulfillment of the requirement for the degree of Doctor, Saint Louis University.

[19] Allaymoun, H.M, (2018). CSCL Chats Analysis and Scientific Threads Discovery, Proceedings of the 8th International Conference on Computer Science and Information Technology (CSIT 2018), Amman, Jordan.

[20] Roschelle, J. and Teasley, S. D., (1995). The construction of shared knowledge in collaborative problem solving. In Computer supported collaborative learning .pp. 69 - 97. Berlin, Heidelberg: Springer.

[21] Ludvigsen, S. et al., (2015). The school of the future: Renewal of subjects and competences (Official Norwegian Reports NOU 2015: 8). Oslo: Norwegian Ministry of Education and Research.

[22] Resta, P., & Laferrière, T. (2007). Technology in support of collaborative learning. Educational Psychology Review, 19.

[23] [23] Allaymoun, H.M, Trausan-Matu, S. (2015). Rhetorical Structure Analysis for Assessing Collaborative Processes in CSCL, Proceedings of the 19th IEEE International Conference on System Theory, Control and Computing, ICSTCC2015, Cheile Gradistei, Romania, pp. 123-127.

[24] Embretson, S. E. (1998). A cognitive design system approach to generating valid tests: Application to abstract reasoning. Psychological Methods, 3, 300-396.

[25] Dick M. Carpenter II, Lindy Crawford, and Ron Walden (2007). Testing the efficacy of team teaching. Learning Environ Research 10, no. 1, 53-65, and doi: 10.1007/s10984-007-9019-y.

[26] Kulieke, M., Bakker, J., Collins, C., Fennimore, T., Fine, C., Herman, J., Jones, B.F., Raack, L., & Tinzmann, M.B. (1990). Why should assessment be based on a vision of learning? [online document] NCREL, Oak Brook: IL. Available online: http://www.ncrel.org/sdrs/areas/rpl_esys/assess.htm.

[27] Harlen, W. & Crick, R.D. (2003). Testing and motivation for learning. In: Assessment in Education, 10 (2): 169-207.

[28] Walvoord, Barbara E. and Virginia Johnson Anderson. (1998). Effective Grading: A Tool for Learning and Assessment. San Francisco: Jossey-Bass.

[29] Semire Dikli. (2003), Assessment at a distance: Traditional vs. Alternative Assessments, The Turkish Online Journal of Educational Technology – TOJET July 2003 ISSN: 1303-6521 volume 2 Issue 3 Article 2.

[30] Panadero, E., & Alonso-Tapia, J. (2013). Self-assessment: Theoretical and Practical Connotations. When it Happens, How is it Acquired and what to do to develop it. Electronic Journal of Research in Educational Psychology, 11(2), 551-576. doi:10.14204/ejrep.30.12200.

[31] Nikou, S. A., & Economides, A. A. (2016). The impact of paper-based, computer-based and mobile-based self-assessment on students' science motivation and achievement. Computers in Human Behavior, 55, 1241–1248. doi:10.1016/j.chb.2015.09.025.

[32] Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in education: principles. Policy & Practice, 5(1), 7–74. http://dx.doi.org/10.1080/0969595980050102.

[33] Bakhtin, M.M., Problems of Dostoevsky's Poetics, Theory and History of Literature Series, vol. 8, Minneapolis, (translated by C. Emerson), 1984.

[34] Bakhtin, M.M., Speech Genres & Other Late Essays, University of Texas Press, Austin, 1986.

[35] Trausan-Matu, S., Dascalu, M., and Rebedea, T., (2014). PolyCAFe – Automatic support for the analysis of CSCL chats. International Journal of Computer-Supported Collaborative Learning, 9(2), 127–156.

[36] Trausan-Matu, S., Stahl, G., And Zemel, A., (2005). Polyphonic Inter-animation in Collaborative Problem Solving Chats, Research Report, Drexel University, Philadelphia.

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