

CLAp to Lesson Planning: A Critical Literacy Framework for Pre-Service Teachers

Geraldine Cardano-Alvina (PhD)

College of Education, Bicol State College of Applied Sciences and Technology, Naga City, Philippines
gcalvina@gmail.com

**Asia Pacific Journal of
Multidisciplinary Research**

Vol. 7 No.4, 70-76

November 2019 Part IV

P-ISSN 2350-7756

E-ISSN 2350-8442

www.apjmr.com

CHED Recognized Journal

ASEAN Citation Index

Date Received: September 30, 2019; Date Revised: November 22, 2019

Abstract -The development of critical literacy skill among pre-service teachers is a concern of Teacher Education Institutions (TEI). The extent of development of this skill can be determined from the quality of the lesson plans and teaching demonstrations that the pre-service teachers prepare and conduct. The purpose of this study is to create a framework that would develop critical literacy skill during the process of lesson plan writing. This is a descriptive quasi-experimental study which was conducted for one semester to two classes of 68 pre-service teachers enrolled in The Teaching of Literature course. Both classes were taught the same lessons but with different methods. One class, the control group, used the expository method; and the other, the experimental group, used the Critical Literacy Approach (CLAp) framework. The outputs of this course are lesson plans and teaching demonstrations. The level of the pre-service teachers' critical literacy was determined based on the evaluation of their lesson plans where the types of objectives and the approach/method/strategies used were analyzed. It was found out that the constant use of the CLAp framework which is composed of three phases - Independent Planning, Collaborative Lesson Planning, and Assessment - was found to have contributed to the improvement of the pre-service teachers' critical literacy skill especially in concept development. Its constant use enhanced their confidence lesson planning and in actual teaching demonstration.

Keywords – Collaborative learning, concept development, objective formulation, strategies, teaching demonstration

INTRODUCTION

One of the agenda for sustainable development goals of the United Nations is to ensure quality education and promote lifelong learning opportunities for all. In order to attain this, the education sector especially the Teacher Education Institutions (TEIs) create preparation programs to make sure that pre-service teachers gain meaningful learning. Meaningful learning happens when learners see some aspects of themselves in the curriculum through critical literacy instruction or culturally responsive pedagogy [1]. In such classroom instruction, teachers facilitate thought-provoking discussions that challenge the students to connect their lives to the text [2] through questioning, exploring, or examining issues that promote reflection, transformation, and action. Critical literacy benefits students in several ways [3]: it can disrupt a common situation or understanding where they are able to understand a text in a different way; it can examine multiple viewpoints where they think about the texts from different perspectives; it can focus on socio-political issues where they examine power

relationships among individuals; and it can take action and promote social justice. While readers make meaning of the texts and undergo a process of social construction [4], they can also promote transformation in their own communities [5].

Critical literacy is crucial for teachers since they are responsible for training their students to become critical literate. In order to teach critical literacy, the teachers must first become critical literate themselves [6]. Thus training for this skill should start with the pre-service teachers in TEIs by promoting culturally responsive pedagogy. In this kind of setting, they are trained to move from beyond comprehension of the text into thinking more critically about it. Additionally, they develop their ability to read texts in an active and reflective manner and they better understand power, inequality, and injustice in human relationships that are expressed in the texts [7]. Teaching and showing the pre-service teachers how to develop critical literacy through practice are the first steps in developing their skill. Thus successful teacher preparation programs need to be

constructed upon pedagogical practice that would empower students to develop excellent intellectual, social, emotional, and political attitude. Moreover, they should also recognize the need to develop instructional strategies that will meet students' needs.

Different frameworks for critical literacy have been adapted in varied teacher preparation programs such as the Guided Comprehension Direct Instruction Framework, Problem Posing, Patterned Partner Reading, and Bookmark Technique [8]; Connection Stems [9]; Say Something [10]; Switching, Alternative Perspectives, Juxtapositioning, and Theme-Based Focus Groups[11] to name a few. Common to these frameworks is collaborative learning. The idea of collaborative learning started from Vygotsy's idea of the *zone of proximal development* which explains that learning is facilitated when a learner is aided/guided by peers or adults[12].The process of collaboration enhances learning of those who demonstrate lower levels of achievement[13]; it encourages dialogues, listening to and reciprocal assessment, collaboration for negotiation and consensus building, activity organization, study and appropriation of bibliographic information, conceptual development, and collective writing [14]. Unlike individual learning, collaborative learning approaches allow learners to work in groups in order to understand concepts, complete tasks, and solve problems. When the learners work together, they can maximize their own and each other's learning by sharing ideas with the group [15] which can result in higher achievement and greater productivity [16]. Collaborative learning is guided by the principles of positive interdependence, individual accountability, face-to-face promotive interaction, group processing, and appropriate use of social, interpersonal, collaborative, and small group skills. Since the effectiveness of collaborative learning largely depends on the quality of student interaction in the classroom, the teacher needs to have the ability to plan, monitor, support, consolidate, and reflect on student interaction [17].

Lesson planning is an essential competence [18] as well as a key in raising effective teachers; however, it is also a skill which pre-service teachers find difficulty in developing [19]. Many of them struggle in demonstrating an ability to write a lesson plan and an ability to implement this plan in the classroom through teaching demonstration. The challenge then to Teacher Education Institutions (TEIs) is to have a

framework that would develop these abilities and increase their confidence in teaching.

OBJECTIVES OF THE STUDY

This study was based on the assumption that pre-service teachers should be critical literate and should have the ability to write and to do teaching demonstration with ease and confidence. The main purpose of this study was to create and evaluate the effectiveness of a framework for developing critical literacy skill. It determined the pre-service teachers' level of critical literacy through the evaluation of the types of objectives that they formulated; types of questions asked; and lesson design based on approach, method, and strategies. Furthermore, the acceptability of the framework was evaluated by the users based on its use for concept development, motivation to learn, utilitarian purposes, and development of confidence.

METHODS

This is a quantitative quasi-experimental study based on the hypothesis that collaborative learning improves the critical literacy of pre-service teachers. This study was conducted for one semester to two classes of The Teaching of Literature (ToL)course with 34 students each. The first class (control group) was taught using the expository/lecture method whereas the other (experimental group) used the Critical Literacy Approach (CLAp) approach framework. ToL is a course which specifically introduces the students to the varied approaches in teaching literature and it trains them to apply each approach to their teaching demonstration lessons. The students enrolled in this course have already taken prerequisite courses which introduced them to lesson plan writing such as the Principles of Teaching, The Teaching of Listening and Reading, Language Curriculum for Secondary Schools; and courses which equipped them with knowledge about literature such as Philippine Literature, World Literature, Afro-Asian Literature, Mythology, Literary Criticism, and Introduction to Stylistics. The same syllabus content was used for both classes but different approaches were employed. The data used in determining the students' level of critical literacy were based on the analysis of formulated objectives and questions; and lesson design in terms of instructional approaches, methods, and strategies. Table 1 shows how critical literacy was determined.

Table 1. Bases for Analysis

Level of Critical Literacy	Level of Objectives	Types of Questions	Focus of Discussion	Types of Strategies
Less Critical	Remembering	Factual	Content only	Describing
Moderately Critical	Understanding	Conceptual	Content & form separately	Interpreting
Considerably Critical	Applying Analyzing	Procedural	Content & form with little connection	Engaging
Highly Critical	Evaluating Creating	Metacognitive	Content, form, other dimensions with strong connection	Connecting Judging

The analysis of objectives was based on Bloom’s revised taxonomy of instructional objectives [21]. The *remembering* objectives are associated with less critical literacy; *understanding* with moderate critical literacy; *applying* and *analyzing* with considerable level of critical literacy; and *evaluating* and *creating* with highly critical literacy. The types of questions asked were evaluated as *less critical literate* if they are focused on factual knowledge; *moderately critical literate* on conceptual knowledge; *considerably critical literate* on procedural knowledge; and *highly critical literate* on metacognitive knowledge. The general approach to instruction was analyzed based on the flow of discussion. They are *less critical literate* if the discussion is limited to its content only; *moderately critical literate* if the discussion extends from the content to either the form or social dimensions of the text but no relationship between them is established; *considerably critical literate* if in the course of the discussion, there are opportunities to explore the content, form and social dimension of the text but very little relationship is established; and *highly critical literate* if differentiated instruction is done in order to establish strong relationship among the content, form, and social dimensions of the text. Specific strategies for differentiated instruction were analyzed and categorized as *describing* (less critical literate), *interpreting* (moderately critical literate), *engaging* (considerably critical literate), and *connecting and judging* (highly critical literate). The placement of these strategies in the phases of the lesson development-initial or preliminary phase, development phase, or assessment phase – was analyzed. The strategies used in the initial or preliminary phase are used for the activation of the schema or for connecting previous lesson to the present; those which are used in the development

phase are generally formative assessment strategies that are used for the discussion of the lesson; the ones used in the assessment phase are for assessing or reflecting on what has been learned. The frequency of occurrences of all these was tallied and the effectiveness of the framework in developing critical literacy was tested using t-test for independent samples. A questionnaire [20] composed of indicators for concept development, motivation to learn, utilitarian purposes, and development of confidence was administered to the users of the framework to evaluate its general acceptability in terms of concept development, motivation to learn, utilitarian purposes, and development of confidence. A 5-point Likert Scale was used to determine its acceptability such as 1.0-1.5 for not effective; 1.6-2.0 for fairly effective; 2.1 -3.0 for neutral; 3.1 – 4.0 for effective; and 4.1 - 5.0 for very effective.

Framework for Critical Literacy Approach to Lesson Planning (CLAp)

The framework for Critical Literacy Approach to Lesson Planning (CLAp) is a structure that is based on the idea that when learners work together, they can maximize learning [17] and achieve higher and greater productivity [18]. In the process of using the framework, the learners have the opportunity to develop critical literacy by becoming aware of the content and other dimensions of the text. The framework is composed of three phases: Independent Planning, Intervention, and Assessment. During the *first phase* or the Intervention Phase, the teacher discusses an approach which can be used in teaching literature (e.g. structuralist approach). After the discussion, the students independently plan their lesson by preparing lesson sequences based on the text provided to them. During the *second phase* or the Actual Intervention, the students prepare lesson plans collaboratively based on the individual lesson sequences they prepared beforehand. The lesson preparation follows five stages: *Stage I* is Focus on Content and Form where the students discuss among themselves their understanding of the text. *Stage II* is Focus on Pedagogy where they talk about the strategies that they will use in discussing the text. *Stage III* is Lesson Concept and Sequence Preparation where the students individually prepare lesson sequences based on what they learned from the sharing. *Stage IV* is Individual Lesson Plan Preparation where the students work on their detailed lesson plans based on their lesson sequence. This is

done as homework. *Stage V* is Teaching Demonstration where a student volunteer conducts a teaching demonstration of his/her lesson plan. *Stage VI* is Reflecting and Critiquing. This stage is part of the *third phase* of the framework which is the Assessment. In this phase, the teacher guides the students in reflecting on their experiences related to lesson plan preparation and teaching demonstration. Table 2 illustrates the framework of the Critical Literacy Approach (CLAp) to Lesson Planning.

Table 2. Framework of the Critical Literacy Approach (CLAp) to Lesson Planning

Phases of the Framework	Steps	Stages of Intervention
A. Independent Planning	1. Teacher discusses an approach to literature teaching. 2. Students individually prepare lesson sequences.	
B. Actual Intervention	3. Students prepare lesson plan collaboratively using their lesson sequence as reference.	I. Focus on Content and Form II. Focus on Pedagogy III. Lesson Concept and Sequence Preparation IV. Lesson Plan Preparation V. Teaching Demonstration
C. Assessment of the effectiveness of the intervention	4. Critiquing of the teaching demonstration	VI. Reflecting and Critiquing

The following are detailed instructions for using the Actual Intervention Phase of the framework:

Stage I Focus on Content and Form. This stage has three purposes: to enhance content knowledge of the text; to be aware of the literary features which should be emphasized (based on the teaching approach); and to explore the social dimension of the text. The students are grouped and given a literary text for discussion. A worksheet with the following instructions is given to them:

Read and discuss the text among yourselves and then complete the paragraph.

The text explains that _____. The important features/elements of the text that expresses it is/are

_____. The text can be used to create awareness of the cultural norms/societal issues such as _____, _____, and _____.

Stage II Focus on Pedagogy. After the outputs are shared with the whole class, the students proceed to the next stage which aims to assist them in formulating objectives, in planning differentiated instruction, and in preparing assessment tools. The following worksheet is given to each group.

Do the following and then share your output with the big group.

1. *Formulate 3 objectives*
2. *List down activities for the following phases of the lesson: Pre-Reading, During Reading, and Post Reading.*
3. *Formulate Assessment/Performance Task*
4. *Develop rubrics for assessment*

Stage III Lesson Concept and Sequence Preparation. Based on the outputs of stage II, each student prepares his/her own lesson sequence which will be submitted at the end of the class time. The ideas may come from the output of his own group or from that of the other groups. In this stage, each student works on his/ her own but the ideas may have come from others. The following worksheet shall be accomplished:

Prepare a lesson concept and lesson sequence. Be guided by the following:

- a. *Main idea of the text*
- b. *Cultural norm/societal Issue to be emphasized*
- c. *Objectives*
- d. *Pre Reading Activities*
- e. *During Reading Activities*
- f. *Post Reading Activities*
- g. *Assessment/Performance Task*
- h. *Rubrics for assessment*

Stage IV Lesson Plan Preparation. This stage is done outside of the classroom and is given as homework. Each student is expected to submit a detailed lesson plan based on his/her prepared lesson sequence. Before the end of the class time, a student volunteers to conduct a teaching demonstration on the next meeting. He/she is assisted by the members of the group.

Stage V Teaching Demonstration. The student conducts a peer teaching demonstration using his/her lesson plan. Three students act as observers to examine the process of teaching. They are provided a

copy of the lesson plan and the following observation guide:

Guide Questions:

1. *Were the objectives suited to the text?*
2. *What activities were done to carry out the objectives? Were they successful?*
3. *What was the performance task? Was it reflective of the approach used?*
4. *What cultural norms/societal issues were emphasized in the text? How did the teacher connect it/them to the text?*

Stage VI Critiquing and Reflecting. This is done after the teaching demonstration. The observers give comments and suggestions based on the guide questions. Other students are encouraged to also give their comments. After the critiquing, the demo teacher shares his/her reflection.

RESULTS AND DISCUSSION

On Formulated Objectives and Discussion Questions

The level of objectives formulated by the students was one of the bases for determining their level of critical literacy. Two sets of lesson plans were analyzed – the first set was composed of those written by students taught using the expository method and the other set by those who used the CLAp framework. Data show that the framework influences the way students frame instructional objectives. Those exposed to the expository/lecture method formulated more of the remembering objectives that are associated with less critical literacy; those exposed to the CLAp framework formulated a higher percentage of the applying level of objectives which are linked to a considerable level of critical literacy. The remembering level of objectives is concerned with the recitation of previously learned information; recall or recognition of knowledge from memory; and emphasis on the retrieval of facts, definitions, or lists which are specifically stated in the text. The following are some sample objectives which the students formulated: name the characters in the story, give descriptions of the setting, state the moral of the story. While these objectives help students recognize information, they do not emphasize the development of critical thinking. The analysis level of objectives, on the other hand requires higher mental function of reorganizing or putting elements together such as the following: explain how metaphors reveal meanings of the text, explain how parallel structures affect the

meaning of the poem, describe how deviation contributes to the interpretation of the text. These data show that critical literacy can be developed through the teachers' approach in instruction. T-test for two independent samples determined the effectiveness of the CLAp framework in terms of objective formulation. The result shows that the students who were exposed to the CLAp framework demonstrated significantly improved critical literacy at $p < .05$ with the t of 6.83689 and p -value of .000023. This result validates the fact that when learners work collaboratively, they are able to better understand concepts [17].

The levels of objectives are also associated with the kind of questions and the tasks that are indicated in their lesson plans. The remembering level of objectives necessitate questions which are limited to facts found in the text, whereas the analysis level objectives created for them more of the conceptual and procedural knowledge questions that indicate a satisfactory level of critical literacy.

Lesson Design: Approaches, Methods, and Strategies

The pre-service teachers' level of knowledge was analyzed based on the approach, method, and strategies indicated in the lesson plans. Based on the analysis, both groups utilized mostly the 4As (Activity-Analysis-Abstraction-Application) method. Those exposed to the CLAp framework however were found to be more knowledgeable and creative in using the method. Those who learned through the lecture method find difficulty in using the 4As correctly specifically in terms of connecting the activity-analysis-abstraction phases which results to a teacher-centered approach. The other group of students, on the other hand were found to be more conscious in making connections and in using other methods such as the Story Reading Framework (SRF), Task-Based Language Teaching (TBLT), and the Pyramidal Approach. Thus they create a more student-centered classroom and the discussions are not only limited to the exploration of the content of the text but extend to and establish connections between it and other aspects like the language forms and social dimension. This kind of flow of the lesson discussion indicates higher level of critical literacy.

Both groups of students were trained to follow three general phases of instruction – the preliminary, development, and assessment. The strategies used in these phases of the lesson were analyzed as *describing* (less critical literate), *interpreting* (moderately critical

literate), *engaging* (critical literate), and *connecting* and *judging* (highly critical literate). The kind of strategies and their placement in the phases of the lesson reveal their level of critical literacy. Those who were exposed to the expositive method used more of the describing type of strategies which include characterization, role playing, making character sketch and character maps, profiling activities, describing pictures, and describing events. These activities focus on factual content of the text and show low level of critical literacy. The other group on the other hand used more of the engaging type of strategies such as playing games, broadcasting, letter writing, making predictions, making twists, providing another ending, and using semantic webs. These strategies reveal the students' conceptual and procedural knowledge that is equated with a satisfactory level of critical literacy. Moreover, the strategies used by those exposed to the expositive/lecture method were concentrated more on the preliminary phase of the lesson. This means that most of the strategies are used not for the discussion of concepts but only for motivation purposes and for setting of the mood of the learners. It was noted that those who were exposed to the CLAp framework distributed their strategies to the different phases of the lesson, the bigger percentage of which is allocated to the lesson development phase. This indicates that they apply differentiated instruction and use formative assessment strategies to explore and understand the text. Although the CLAp framework has not reached the level of developing highly critical literacy among the majority of students, it has influenced them in using strategies which develop critical thinking. The t-test result shows that those who were exposed to the CLAp framework demonstrated significantly improved critical literacy at $p < .05$ with the t of 3.18728 and p -value of .006428. In order to develop pre-service teachers who are critical literate, the teacher preparation programs should empower students to develop not only social and emotional attitude but also intellectual outlook through excellent pedagogical practices [9].

Table 3. Acceptability of CLAp Framework

Indicators of Effectiveness	Expositive Method	CLAp Framework
Motivation to Learn	Effective (3.5)	V Effective (4.3)
Concept Development	Effective (3.6)	V Effective (4.7)
Utilitarian Purpose	Effective (3.3)	V Effective(4.4)
Development of Confidence	Effective (3.2)	V Effective(4.2)
Average	Effective (3.4)	V Effective (4.4)

The acceptability of the CLAp framework was evaluated based on the following indicators: motivation to learn, concept development, utilitarian purposes, and development of self-confidence. Table 3 shows the weighted mean of the result of evaluation.

After the end of the semester, the two groups of students were evaluated based on their experiences and learning in The Teaching of Literature Class. Data show that the constant use of the CLAp framework was found to be very effective in terms of concept development ($m=4.7$) where students said they are certain that they understand ideas taught in the course and that they learned a great deal about the subject. Moreover, they think that the CLAp framework gave them more opportunities to explore other things aside from what the text literally says and they also added that it has exposed them to varied ways of integrating the text across other disciplines ($m=4.4$). 2. I think what I learn from this class is useful for my future profession. Furthermore, the framework kept their interest in learning ($m=4.3$); and developed their confidence in teaching demonstration ($m=4.2$). The t-test result showed that the use of the CLAp framework is generally acceptable at $p < .05$ with the t of 7.57417 and p -value of .000017.

CONCLUSION AND RECOMMENDATIONS

The framework for the Critical Literacy Approach (CLAp) to lesson planning which puts emphasis on working collaboratively helps pre-service teachers develop critical literacy skill, formulate high level objectives, ask pertinent questions, use creative formative strategies, and design student-centered classroom setting. Its constant use has developed the pre-service teachers' confidence not only in lesson plan preparation but also in actual teaching demonstration. Moreover, the framework has been useful in terms of concept development, motivation, and utilitarian purposes. The following should be considered, though in using the framework: it is time-consuming; it needs the teachers' expertise to facilitate the process especially during the synthesis of the ideas from each group; it has to be used constantly so that the students will get used to the process; the teacher should have ample knowledge of the teaching approach since it will direct the students to the specific form that should be emphasized in each lesson; and the teacher should first be critical literate.

REFERENCES

- [1] Irvine, J.J. (2001). The critical elements of critically responsive pedagogy: A synthesis of the research. In *Culturally responsive teaching: Lesson planning for elementary and middle grades*. Boston: McGraw-Hill.
- [2] Freire, P. (1970). *Pedagogy of the Oppressed*. New York: Continuum.
- [3] Lewinson, M, Flint A.S., & Van Sluys, K. (2002). Taking on Critical Literacy: The journey of newcomers and novices. *Language Arts*, 79(5), 382-392.
- [4] Norris, K, Lucas, L, & Prudhoe C. (2012). Examining Critical Literacy: <https://files.eric.ed.gov/fulltext/EJ1001528.pdf>
- [5] Clark, L., & Whitney, E. (2009). Walking in their shoes: Using multiple-perspective texts as a bridge to critical literacy. *Reading Teacher*, 62(6), 530-534.
- [6] Dosier, C, Johnston, P., & Rogers, R. (2006). *Critical literacy critical thinking: Tools for preparing responsive teachers*. New York: Teachers College Press.
- [7] Coffey, H. (2008). Critical literacy. https://scholar.google.com/citations?user=3D08fVwAAAAJ&hl=en#d=gs_md_cita-d&u=%2Fcitations%3Fview_op%3Dview_citation%26hl%3Den%26user%3D3D08fVwAAAAJ%26citation_fo_r_view%3D3D08fVwAAAAJ%3ARHpTSmoSYBkC%26tzom%3D-480
- [8] McLaughlin, M., & Allen, M.B. (2002). *Guided Comprehension: A teaching model for grades 3–8*. Newark, DE: International Reading Association.
- [9] Harvey, S. & Goudvis, A. (2001). *Strategy Instruction in Action*. Portland, ME: Stenhouse.
- [10] Short, K.G., Harste, J.C., Burke, C., & contributing teacher researchers, Gloria Kauffman, et al. (1996). *Creating classrooms for authors and inquirers / English, Book, Illustrated edition*.
- [11] *Critical Literacy: Enhancing Students' Comprehension of the Text*. http://educationalleader.com/subtopicintro/read/scholastic/scholastic_343_1.pdf
- [12] Wertsch, J. V., & Sohmer, R. (1995). Vygotsky on learning and development. *Human development*, 38(6), 332-337.
- [13] Kelly, G. (2017). Two (or more) heads are better than one. *International Teacher Magazine*. Retrieved: <https://consiliumeducation.com/itm/2017/01/04/two-or-more-heads-are-better-than-one/>
- [14] Roselli, N. (2016). Collaborative learning: Theoretical foundations and applicable strategies to university. *Propositos y representaciones*, 41(1), 219-280.
- [15] Roger, T., & Johnson, D. W. (1994). An overview of cooperative learning. *Creativity and collaborative learning*.
- [16] Li, M. P., & Lam, B. H. (2013). *Cooperative learning. The Active Classroom*, The Hong Kong Institute of Education.
- [17] Kaendler, C., Wiedmann, M., Rummel, N., & Spada, H. (2015). Teacher competencies for the implementation of collaborative learning in the classroom: A framework and research review. *Educational Psychology Review*, 27(3), 505-536.
- [18] Pang, M. (2016). Pedagogical reasoning in EFL/ESL teaching: Revisiting the importance of teaching lesson planning in second language teacher education. *Teachers of English to Speakers of Other Languages, Inc. (TESOL)*. 50(1), 246-263.
- [19] Sahin-Taskin, C. (2017). Exploring pre-service teachers' perceptions of lesson planning in primary education. *Journal of Education and Practice*, 8(12), 57-63.
- [20] Anderson, L. W., Krathwohl, D. R., Airasian, P., Cruikshank, K., Mayer, R., Pintrich, P., ... & Wittrock, M. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy*. New York: Longman Publishing.
- [21] Pintrich, R.R. & DeGroot, E.V. (1990). Motivational and self-regulated learning components of classroom academic performance, *Journal of Educational Psychology*, 82, 33-40.

COPYRIGHTS

Copyright of this article is retained by the author/s, with first publication rights granted to APJMR. This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4>).