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Knowledge Building: A Good Way to Teach Educational Research Methodology

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ABSTRACT

Educational research skills are a relevant issue to education professionals. Knowing how to investigate makes it possible to generate knowledge to guide educational interventions and evaluations/assessments. An important aspect is to decide on the focus of training to develop research skills, both specific (e.g. formulating a research problem, collecting data, analysing data), and cross-cutting (working collaboratively). Knowledge Building (KB) pedagogy is a coherent approach to teach resarch skill. KB encourages sutdent asume the responsability to carry out collaborative process to build conceptual artefacts. The purpose of this communication is to train students in educational research skills applying the Knowledge Building pedagogy supporting by Knowledge Forum (KF). This platform offers students and teachers a collaborative workspace where ideas supported by evidence can be shared, discussed, negotiated and improved. A comapartive pretest-posttest design was applied to analyse whether students perceived improvements in their educational research skills. Likert scale questionnaires were applied to collect the data. The participants were 51 students enrolled in a course about educational research in Higher Education. The results show positive changes in the student's perception between the beginning and the end of the course. Improvements in the teaching of educational research based on Knowledge Building Pedagogy are discussed.

Keywords: Collaboration, Educational Technology, Educational Research, Knowledge Building, Research Skills

Introduction

Knowing how to research in the classroom is important for teachers (Valter & Akerlind, 2010). Research is understood as a systematic, methodologically controlled and transparent process with the aim of generating and using new

knowledge (Colás & Buendía, 1998; Creswell & Gutterman, 2021). Knowing how to research means knowing how to articulate a series of skills to answer research questions (Colás & Hernández, 2021): knowing how to recognize areas in need of research, reviewing the state of the matter, applying and combining procedures and techniques for data collection and analysis, reflective and communication skills. A professional who masters these skills can know and generate scientific knowledge that guides educational practices. Teachers can conduct research on their practices to improve their students' learning circumstances (Engelmann et al., 2016), and may also use methods to assess educational outcomes (Holden et al., 1999). However, unlike PhD studies, in undergraduate degrees few credits are allocated for training in research competences (Lambie et al., 2014; Jorgensen & Duncan, 2015, Petko, 2020). This means that students have few learning experiences that allow them to have quality training in educational research. This explains studies on the perception of students regarding the value of the subject in educational research. These studies indicate that students from Educational Sciences in Higher Education often consider research skills to be worthless for their professional future, and therefore they turn out to be ineffective in conducting research (e.g. Rodríguez-Chirino & Gutiérrez-Braojos, 2021; Akerlind, 2008, Ponterotto & Grieger, 1999).

Another important aspect is the relevance of the training approach. Under the umbrella of European credit, teaching methodologies place at the center the idea of learning by doing with others, coherently integrating moments for reflection and improvement of the actions and ideas developed in a topic (Gutiérrez-Braojos et al., 2020). According to this, educational research interventions have been directed to (Gutiérrez-Braojos et al., 2021):

- Attendance at specific research conference to learn what and how experts in the educational field investigate;
- Courses aimed at training in specific educational research skills (e.g. searching for information, writing and discussing research papers);
- Student participation in the activity of research groups carried out by expert research groups.
- Empower students to make groups with their peers and carry out their own research projects while receiving support and guidance from the teacher.

These educational proposals are based on socioconstructivist approaches versus traditional reproductive content teaching. The Knowledge Building pedagogy is consistent with the ideas proposed in the previous section. This socioconstructivist pedagogy aims at empowering students in the construction of their ideas on a topic or knowledge theme (Scardamalia & Bereiter, 1994; Zhang et al., 2009; Van Aalst & Chan 2012. The KB is based on the idea that students who exhibit high levels of epistemic collective agency achieve higher levels of collaborative achievement (e.g. Gutiérrez-Braojos et al., 2019; Strauß & Rummel, 2021;

Scardamalia & Bereiter, 2021). This involves engaging students in collaborative activities such as establishing common learning objectives in educational research, identifying research needs, negotiating which research problems are most relevant, inquiring, discussing and developing ideas on how to conduct educational research, making decisions about possible designs, procedures and techniques to carry out their research, as well as finding the best way to share the findings. In summary, students trained according to the KB pedagogy collaborate to improve ideas on how to face and carry out educational research. Knowledge Building pedagogy is often implemented through blended modalities, i.e. by combining online and offline teaching activities (Arce, 2022). For this purpose, the Knowledge Forum platform is often used. A technological artefact for collaborative and creative work with ideas (Scardamalia, 2004). The software offers a virtual space in which students can share, discuss and organise data, ideas.... in notes that are linked together. The KF allows any type of file to be attached.

Overall, training in educational research is key for education professionals. The Knowledge Building pedagogy empowers students to assume collective epistemic agency (Yang et al., 2020). This communication aims to carry out an intervention from the KB pedagogy to promote the collective epistemic agency and assess the self-efficacy perception of students to carry out an educational research. In this sense, high levels of collective agency are expected to be related to high levels of achievement in learning research competencies.

Methodology

In this study, a comapartive pretest-posttest design was applied to analyse whether students perceived improvements in their educational research skills. In particular, various questionnaires are applied to participants at two points. The first in the first two weeks at the beginning of the course, and the second during the last two weeks of the course (see Table 1).

Table 1. Variables, Data collection instruments, and application moments

	Moment 1	Moment 2
Instruments	Questionnaires-Likert	Questionnaires-Likert
Variables	Research Competence Collective Agency Starting point	Research Competence Collective Agency

Participants

The participants are 51 students enrolled in the 2nd year of the education degree program at the University of Granada who participated voluntarily in this research. They participated in an educational research subject for 16 weeks

according to the KB pedagogical principles to advance in the collective understanding on educational research topics and carry out a research on an educational problem of their interest. The students worked in a hybrid scenario supported by the Knowledge Forum platform (Scardamalia, 2004). This required training sessions during the first two weeks with the aim of training students in the KB principles and the use of the KF platform. This study is part of research project (see section: Aknowledgments). This research project involving human participants was reviewed and approved by Research Ethics Committe from the University of Granada.

Instruments

Students voluntarily responded to a battery of questionnaires in two different moments. In this communication we collect the results of 2 of the questionnaires applied at the beginning of the course, and at the end of it:

- Questionnaire of self-efficacy in educational research (Holden et al., 1999). This one-dimensional questionnaire is widely used ($\alpha = .99$). This questionnaire is made up of 9 items based on a 5-point Likert scale with values ranging from "1" to "5", "1" means "I can't do anything" and "5" means "I can do it completely". This questionnaire measures the extent to which students feel confident to carry out skills relevant to the educational research competence, for example, "Design and implement the best possible data analysis strategy for the study of a specific aspect of the educational practice".
- Questionnaire on collective agency (Zhang et al., 2019; Zhang et al., 2021). This recent questionnaire consists of three dimensions. The first dimension "collaboration and sharing ideas, CS" consists of 10 items ($\alpha = .97$), the second dimension "Team Consciousness, TA" of 6 items ($\alpha = .98$), and the third dimension "collective efficacy CE" consists of 3 items ($\alpha = .95$). These items are based on a 5-point Likert scale with values ranging from "1" to "5", "1" means "my opinion does not represent anything to me" and "5" means "totally represents my opinion". Some items in the questionnaire are: "When working in group, I think it is important to share ideas and learning resources (CC)"; "When I have not understood the point of view of my group members, I have actively asked (CG)"; "Even if we encounter difficulties, we can complete the learning tasks of this course well (EG)."
- Questionnaire of questions on omen variables: basic knowledge to carry out an educational research, value of the subject for the professional future, difficulty of the content, interest or motivation for the subject content, achievement expectations in learning, achievement expectations of high grades, emotions transmitted by the subject, expected learning attitude. These questions were answered with a 3-point scale whose labels depend

on the items. For example, for the item "value of the subject for the professional future", 1"" means null value, "2" moderate value, "3" high value.

Data analysis

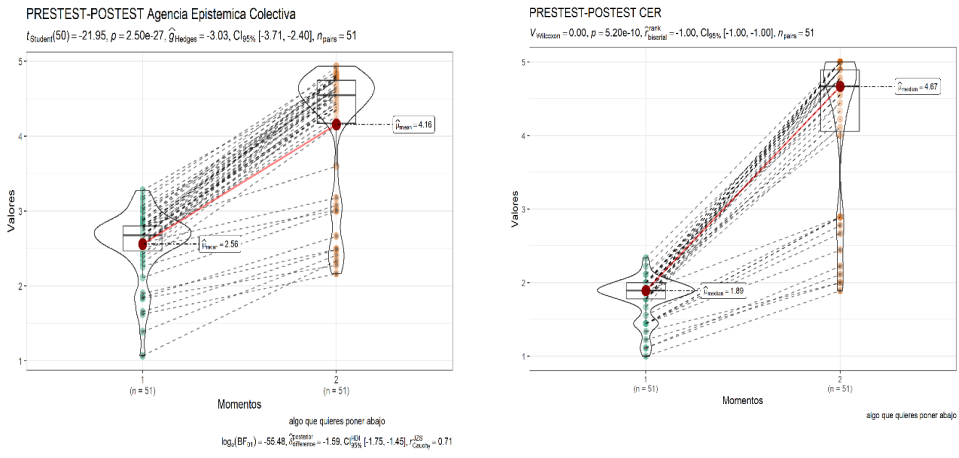
Various analyses have been carried out in this study. For the analysis of the questionnaires of collective agency and research competencies, comparative analyses have been carried out between moments "1" and "2" using the non-parametric test of W, adding the size of the effect. Subsequently, a Cluster (Kmedias) analysis has been carried out. For the analysis of the questionnaire of omen variables (starting point) a percentage analysis was applied. For the analysis, several Rstudio packages have been used to analyze the data and elaborate the graphs.

Results

Analysis of the intervention benefits through questionnaires: collective agency and educational research competence

Descriptive statistics have been used to analyze the data obtained with the records of continuous activity on the platform, questionnaires on collective agency, and self-efficacy in educational research.

The statistical values have increased at the end of the course compared to the beginning. The non-parametric test W has been applied. The differences between the two moments are significant ($p < .000$) showing a large effect size in both variables.



Epistemic Collective Agency

Self-Efficacy in Educational Research

Figure 1. Students' perceptions of team awareness in two moments

The figures show that students improve their perception for the dimensions of collective agency and skills to carry out educational research. From the graphs, a positive and significant relationship between the collective agency and the research competences is also interpreted. That is, improvements in collective agency could be related to improvements in educational research competence.

The graphs also indicate the transitions of the students between the beginning and end of the course. Student scores do not vary in the same way for all participants. Especially at moment 2 it is observed that the participants are divided into two groups. A group (with a small number of cases) shows scores somewhat lower than their peers. The most obvious case is scientific competence.

Cluster Analysis

The results of a cluster analysis show two groups of students (Figure 2). On the one hand, a cluster of 12 students presents low scores in collective agency and educational research competence. This cluster has been called "students with high resistance to learning". On the other hand, a second cluster made up of 39 students presents high scores in the variables that comprise the collective agency and in the educational research competence.

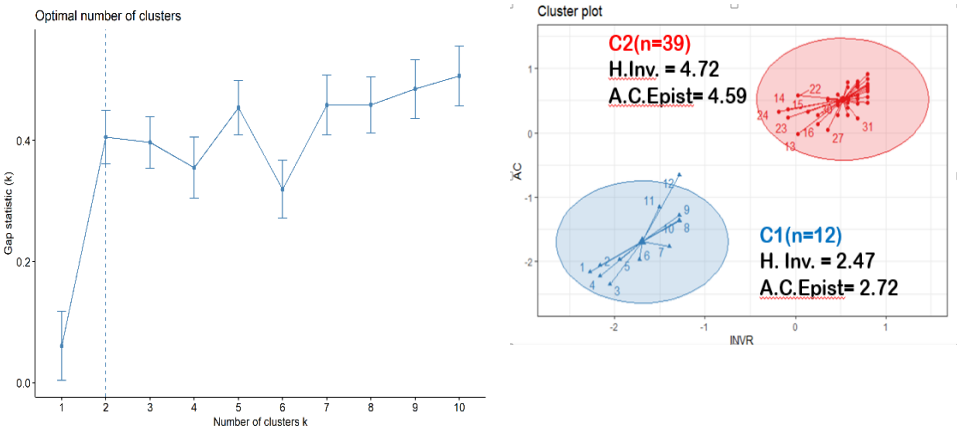


Figure 2. Number and representation of Clusters

Analysis of the omen variables: perceptions at the beginning of the course

In order to understand the reasons that justify both Clusters, pre-intervention omen variables have been analyzed: previous knowledge about educational research, interest in the content, perceived difficulty... (See Figure 3).

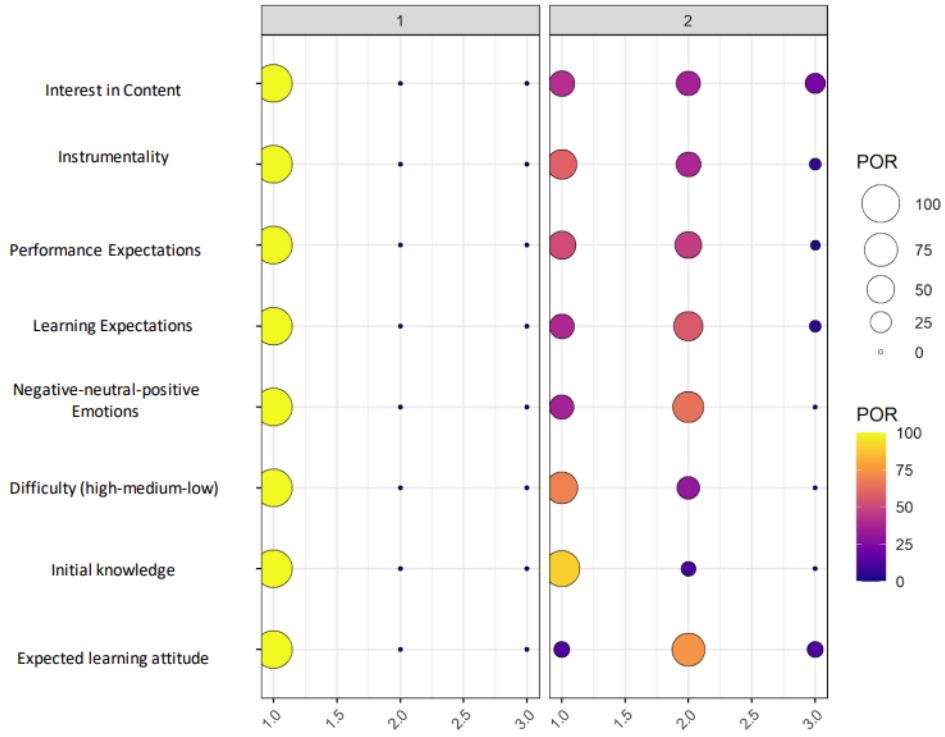


Figure 3. Students perceptions at the beginning of the course according to clusters

The results show that both clusters are similar when it comes to recognizing not having previous knowledge, the high difficulty of the subject, and experiencing a lack of positive emotions towards the subject. Cluster 2 presents a higher percentage of students who score moderately on motivational and emotional variables, showing expectations of achievement in both performance and learning despite the perceived difficulty. In addition, cluster 2 stands out for having a high percentage of students who state that they would have an active attitude to learn the subject.

Discussion and Conclusion

In this communication we present the partial results of a broader work (R + D + i project). The results show that the KB has generated an improvement in collective agency and skills in educational research.

In addition, two clusters of students have been found in this study. They differ from each other according to the level of collective agency and self-efficacy to conduct educational research. The first cluster consists of a small number of students. This cluster is characterized as having achieved a moderate development of skills in educational research at the end of the course and presenting low scores in collective agency. The second of these clusters is composed of the majority of students. This cluster is characterized by high scores in collective agency and skills for educational research. These results coincide with previous studies concluding that levels of collective agency can explain levels of educational attainment (Zhang et al. 2021; Gutiérrez-Braojos et al., 2019), especially when the work methodology requires collaboration with others to improve ideas, and carry out research, as is the case with this study.

In order to understand the reasons that justify both Clusters, pre-omen variables prior to the intervention have been analyzed. The results show that, regardless of the cluster of belonging, the students do not have any knowledge prior to the subject to carry out an educational research. Likewise, another considerable number of students consider this training in educational research to be alien or not very relevant to their profession. However, in cluster 2 made up of students who manifest a greater collective agency and competencies in educational research, a larger group of students who manifested an active attitude in the subject is observed.

In conclusion, recognizing the limitations, the results of our study lead us to affirm that:

- Students are able to progressively take collective responsibility for their learning when given the opportunity.
- Empowering students to assume this responsibility generates improvements in transversal and specific competences in the majority of students.
- Future studies should test the implementation of KB in longer periods to train future teachers' capability of reflecting on the action in their classrooms (experience of 3 months, there are few credits in educational research).

This study has had a relatively short duration for the time a student needs to adequately develop educational research competences. This duration is a mandatory condition of our higher education context. Therefore, we believe that other studies of longer duration that do not have these limitations could obtain even better results.

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