

EDULEARN²²

**14TH INTERNATIONAL CONFERENCE
ON EDUCATION AND NEW LEARNING
TECHNOLOGIES**

**PALMA (SPAIN)
4TH-6TH OF JULY, 2022**



CONFERENCE PROCEEDINGS



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Published by
IATED Academy
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EDULEARN22 Proceedings

14th International Conference on Education and New Learning Technologies
July 4th-6th, 2022
Palma, Mallorca, SPAIN

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DOI: 10.21125/edulearn.2022
ISBN: 978-84-09-42484-9
ISSN: 2340-1117

Book cover designed by J.L. Bernat

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These proceedings are published by IATED Academy. The registered company address is: Plaza Legión Española 11, 46010 Valencia, Spain.

Bibliographic Information

Book Title 14th International Conference on Education and New Learning Technologies	Book Series EDULEARN Proceedings	Editors Luis Gómez Chova Agustín López Martínez Joanna Lees
Publication Year 2022	Publisher IATED Academy	Publisher Address Valencia, Spain
Book ISBN 978-84-09-42484-9	Series ISSN 2340-1117	DOI 10.21125/edulearn.2022
Conference Name EDULEARN22	Dates July 4th-6th, 2022	Location Palma, Mallorca, Spain
Copyright Information This work is subject to copyright. All rights reserved.	Topics Education Educational Research Educational Technology	

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Abstract

Individual social responsibility is closely related to the civil engineers professional activity but, traditionally, their formation has been focused on the technical aspect, leaving the human dimension behind. In that regard, this study analyses how certain assignment can influence the social responsibility of civil engineering students. The selected assignment was a written research work, that would be delivered online, as a Wikipedia article. The study was conducted with 11 students from the third year, over the fifth and sixth semesters. For the study, students were assigned 3 research works, and half of the students were randomly required to deliver the work online, as a Wikipedia article, while the rest would deliver it to the teacher on a traditional paper format. To check students background and track the changes in the social responsibility, a previously defined and tested likert questionnaire was used. Students were also asked about other aspects related to frequency consulting civil engineering topics and editing Wikipedia. Students were required to fill the questionnaire before the first assignment and after each one, four times in total. Likert questionnaire showed how students perception on the articles published in Wikipedia changed during both semesters. Although initial hypothesis could not be confirmed, no changes in social responsibility were identified, results revealed some interesting information about certain social responsibility dimensions, such as lack of student awareness on the impact formation had on their social responsibility.

Keywords: social responsibility, civil engineering, Wikipedia, generic competences, transversal skills.

1 INTRODUCTION

When designing, building and managing public infrastructures, civil engineers make decisions that affect the whole society. These decisions have a great impact on our lives, which lasts for a long period as infrastructures have a long service lifetimes. Therefore, civil engineering is more than just designing or building, a broader vision of the future is needed, where sustainability, respect for the environment and the effect on future generations should be taken into account (Ramírez and Seco, 2012).

In that regard, individual social responsibility may be defined as the responsible behaviour of an individual in society, who show interested in the challenges faced by society and adopts a pro-active approach to solving them, acting in the benefit of others and in the spirit of personal independence (Pacesila, 2018). This individual social responsibility definition is closely related to the civil engineers professional activity, and is in line with the code of ethics proposed by civil engineering associations (ASCE, 2020).

However, the formation of the civil engineers has traditionally been focused on the technical aspect, leaving the human dimension behind (Ramírez and Seco, 2012; Newberry et al., 2011), despite some attempts to introduce them in civil engineering syllabus (Gil-Martín et al., 2010). Furthermore, it seems that there is a decreasing tendency for some engineering students on average social responsibility attitudes over time (Bielefeldt and Canney, 2016).

University education plays an important role in the personal social responsibility development of future engineers, as university is a prelude to professional career (Rulifson and Bielefeldt, 2019). But specific academic training on generic competences is not always possible, as syllabuses do not include such possibility, and it has to be done through activities that are implemented as part of other subjects (Perez-Martinez et al., 2014), such as writing tasks. In that regard, research papers, the ones that incorporates and synthesizes information from multiple bibliographic sources, are the most common writing tasks (Cooper and Bikowski, 2007).

On the other hand, one of the many tools that can be used to promote student engagement is Wikipedia, a tool that university students often use to find information (Henderson et al., 2015). Wikipedia has been previously studied as a tool to analyse gender differences, work literacy skills, use as flipped learning or

project-based learning approach, to mention a few (Johinke and Lauro, 2020). But knowledge sharing through Wikipedia may also be related to social responsibility, as sharing the information not just with colleagues, but with society, may be a way to act in the benefit of others and in the spirit of personal independence. Hence, the main research question made in this study is: can the social responsibility of university students be improved by requiring students to share their writing assignments on Wikipedia? In addition, some other secondary questions were posed: (a) how often do students consult Wikipedia and what type of information do they look for?, (b) how reliable do they consider that information?, and (c) how often do they edit it?

2 METHODOLOGY

This section describes the two main tools employed during the study: the student assignment, which was expected to have an impact on the Social Responsibility (SR) of students, and the tool used to measure changes in SR, a likert questionnaire.

2.1 Students and assignments

The study was conducted with students enrolled in the third course of Civil Engineering Bachelor in the Bilbao Engineering Faculty, all attending to the subject named Water Resources and Facilities Management, which lectures are given during two semesters, with a total of 120 school hours. At the beginning of the course a total of 13 students were enrolled, but only 11 took part on the study.

At the course opening, the students were asked to write three papers, synthesizing information from multiple bibliographic sources. All topics were defined by the teacher, and were related to hydraulic infrastructure. However, half of the topics were covered in the course, and the other half were not, although they were hydraulic infrastructure, in particular Sustainable Urban Drainage Systems or SUDS.

The topics were randomly assigned to students on weeks 2, 6 and 10 of the first semester, and students were given 4 weeks to complete the task. The length of the paper should be between 1000 and 2000 words, and include references, which would not count as part of the length of the paper.

Students were asked to present their papers in two different ways. The first one would be a traditional physical paper, in physical or digital format, so that the work would only be read by the teacher. The other alternative to submit the paper was to write a Wikipedia article online, so that the work would be accessible to everyone. Half of the students were asked to do it in a traditional way, and the other half online. The submission type was also randomly assigned. The working language was Basque, as it was the language used in the course.

Students were not given any special instruction during the study. They were given a little information about how to edit Wikipedia, by simply directing them to the Wikipedia page that includes that information.

2.2 Likert questionnaire

The main goal of the study was to analyse if there was any change in the Social Responsibility of students after they completed an individual task with the online format, if compared with the traditional format. In order to measure the social responsibility of the students a likert questionnaire was used, which they completed using the university's online platform once each task was finished. Thus, students completed the questionnaire on weeks 1 (before first assignment), 6 (after first assignment), 10 (after second) and 14 (after third).

The questionnaire was designed by García-Ramos et al. (2016). They defined the Social Responsibility of the University Student (SRUS) as the "ability to commit themselves to others, to listen and dialogue, to think critically about problems that lead to the discovery of values, to exercise empathy, to understand the true meaning of service and work for the common good, to learn to do in order to be able to influence their own environment through teamwork, being aware that personal action has an impact on social improvement and that, to the extent that they exercise their responsibility as university students, they will be socially responsible professionals".

Based on that definition, they defined a four dimension construct, and developed a likert questionnaire assigning five indicators to each dimension, as shown in Table 1. For our questionnaire, each indicator was assigned five levels, from Strongly Disagree (1) to Strongly Agree (5). The odd number was chosen

in order to get a neutral anchor value (Bhattacharjee, 2012). A sixth level was assigned the value “I do not know”, which was later dropped for analysis.

Table 1. Likert questionnaire to measure the SRUS (García-Ramos et al., 2016).

Dimension 1. Commitment to others and the environment	
1.	I have a global vision of the current world situation and I am aware of the urgent need for sustainable development.
2.	This awareness increases my interest as a university student in contributing to the improvement of my immediate environment.
3.	I question my personal position in the face of social injustice, in the face of the pain of others.
4.	I put into practice my capacity for service and commitment to immigrants, the disabled, the destitute, children without resources, the elderly...
5.	I consider that one of my obligations as a person is to help others through social commitment.
Dimension 2. Personal discovery of values	
6.	I believe that social commitment is based on the recognition and respect for the dignity of every person.
7.	I recognise the need to be open to others, to put myself in their place and to seek the common good, above individualistic interests.
8.	I consider that personal change is a prior and necessary step to change the reality around me.
9.	I have experienced first-hand the happiness that comes with service and solidarity.
10.	I consider that the experience of giving myself to others is beneficial for discovering personal values.
Dimension 3. Formation of social responsibility	
11.	I believe that being a university student helps me to become aware of the importance of social responsibility.
12.	I have reflected on the importance of not remaining indifferent or oblivious to what happens to others.
13.	I believe that the more I study and prepare myself thoroughly at university, the more I will be able to contribute to social change.
14.	The training I will receive at university will contribute in practice to an increase in my degree of social responsibility.
15.	I consider that social responsibility is a competence that should be developed at university.
Dimension 4. Approach to professional practice from the perspective of social commitment.	
16.	I approach the exercise of my future profession with a vocation of service and an orientation towards the common good.
17.	I consider that good professional practice implies commitment, teamwork, perseverance, empathy, tolerance, honesty and respect.
18.	I believe that my personal fulfilment and happiness come from being a professional committed to improving society as a whole.
19.	I believe that the actions of a good professional have repercussions in their immediate environment and in others of greater importance.
20.	I believe that it is realistic to affirm that social commitment is possible through professional practice.

On the other hand, further questions were added to the questionnaire, in order to analyse two additional aspects: previous experience editing Wikipedia and opinion related to make a work public. All questions are given in Table 2. All questions were given 5 options. Questions asking for frequency (21, 23, 25 and 27) were given these choices: never (1), once a month (2), once a week (3), once a day (4), and more than once a day (5). The rest (22, 24, 26, 28, 29 and 30) were given the same options as the likert scale: Strongly Disagree (1) to Strongly Agree (5).

Table 2. Additional likert-type questionnaire.

Knowledge and usage about Wikipedia	
21	Please indicate how often you make general Wikipedia queries.
22	The reliability of these queries is high.
23	Indicate the frequency of consultations in Wikipedia to check Civil Engineering topics.
24	The reliability of these queries is high.
25	Indicate the frequency of consultations in Wikipedia to check topics related to Hydraulic Works.
26	The reliability of these consultations is high.
27	Indicate how much Wikipedia edits.
Feelings about making the paper public	
28	Making my work public on Wikipedia has improved the quality of regular work.
29	I feel uneasy about making my work public on Wikipedia.
30	Making my work public on Wikipedia requires more work than usual.

Based on the questionnaire types, Likert Scales (Table 1) and Likert-Type (Table 2), data analysis was different. For the Likert Scales, where four dimensions were analysed, means and standard deviations were used. For Likert-Type data, modes, medians, and frequencies were used (Boone and Boone, 2012). Data analysis was made with R software and likert package (Bryer and Speerschneider, 2016).

3 RESULTS

This section will present, firstly, the results of the first questionnaire, in order to identify what was the initial student profile. Later, the evolution in the results will be analysed.

3.1 Students initial profile

Answers given to the questionnaire by students to the SRUS questionnaire at the beginning of the study are given in Fig. 1 barplot. All students agreed with most of the items, although agreement levels vary between dimensions, and also between items. As a summary, mean and standard deviation for each dimension and the complete questionnaire are given in Table 3. Those results will be the baseline scenario in the next section, in order to compare temporal evolution of the SRUS questionnaire answers.

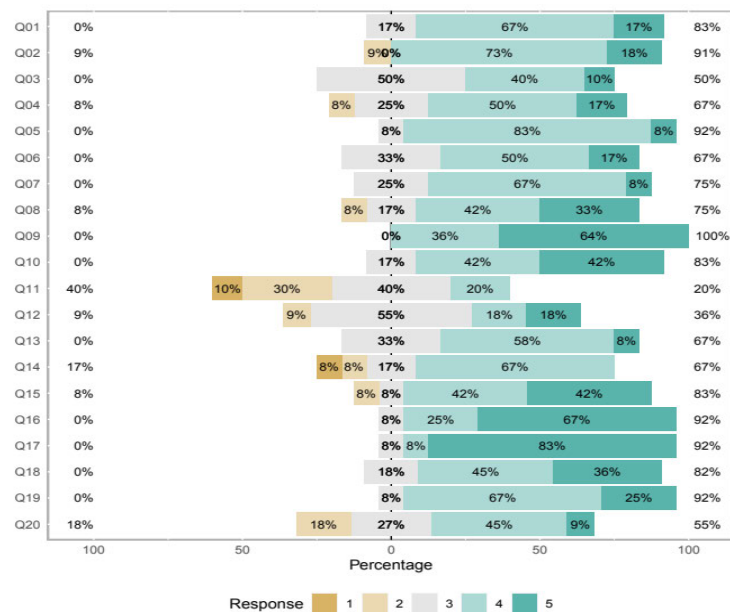


Figure 1. Barplot for the SRUS questionnaire answers before assignments.

The dimension that students disagree more is the third one, related to formation. This may show that students are not aware of the privilege and the responsibility related to the access to higher education, contributing to social justice, giving back everything they learned during their academic life. On the contrary, the fourth dimension is the one students agree more strongly, showing that students are aware that professionals are committed to their environment, and shall work by putting people at the centre of their work, respecting their rights and fulfilling their obligations, in accordance with their code of ethics.

Table 3. Mean and standard deviation for each dimension, and the total questionnaire, before assignments.

	<i>Mean</i>	<i>Standard deviation</i>
Dimension 1	3.88	0.683
Dimension 2	4.10	0.759
Dimension 3	3.53	0.984
Dimension 4	4.24	0.823
Total	3.94	0.858

On the other hand, answers from additional likert-type questions are shown in Fig. 2 barplot. These results show that students use Wikipedia more than once a week, and that they use it more often for general topics (Q21) than queries related to Civil Engineering (Q23) or Hydraulic Works (Q25). This, contrasts with the reliability assigned to the Wikipedia information in each area, as almost half of them show a neutral position in regard to the reliability. In that regard, students consider general queries (Q22) have similar reliability to those related to Civil Engineering (Q24) or Hydraulic Works (Q26). In regard to the previous Wikipedia editing experience (Q27), most of the students have never edited it.

Also, considering that the first questionnaire was done after students were explained the assignment procedure, the answers showed that most of the students though writing in Wikipedia would not improve the quality of the work (Q28). Also, it shows that most of the students did not feel comfortable making their assignment public (Q29), and they believed that Wikipedia editing was going to involve more work than usual (Q29).

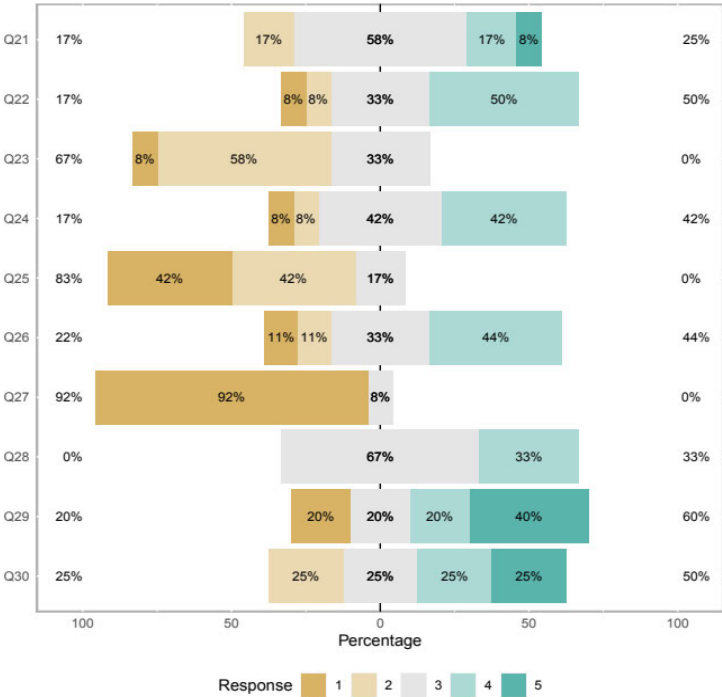


Figure 2. Barplot for the additional likert-type questionnaire answers before any assignment.

3.2 Evolution of the SR

To analyse the influence that assignment type may have in students SR, mean and standard deviation are given in Table 4 for each dimension and assignment type. Results are given by assignment (Table 4) and by week (Table 5). In general, results indicate that there is not a significant change among students SR depending on the assignment type, as measured SR variation is too small.

Table 4. Mean and standard deviation after assignment submission on weeks 6, 10 and 14, with separate values for traditional submission and Wikipedia submission.

	<i>Traditional</i>	<i>Wikipedia</i>	<i>Total</i>
<i>Dimension 1</i>	4.01 ± 0.662	3.97 ± 0.694	3.99 ± 0.677
<i>Dimension 2</i>	4.17 ± 0.738	4.26 ± 0.663	4.21 ± 0.701
<i>Dimension 3</i>	3.94 ± 0.879	3.73 ± 1.000	3.84 ± 0.946
<i>Dimension 4</i>	4.21 ± 0.742	4.28 ± 0.671	4.24 ± 0.706
<i>Total</i>	4.08 ± 0.764	4.06 ± 0.800	4.07 ± 0.782

On the other hand, the SR change has been analysed over time, in order to see if any temporal change could be detected. Results given on Table 5 show that students SR has not changed during the semester.

Table 5. Mean and standard deviation after assignment submission, each week.

	<i>Week 6</i>	<i>Week 10</i>	<i>Week 14</i>	<i>Total</i>
<i>Dim. 1</i>	4.00 ± 0.759	4.00 ± 0.611	3.97 ± 0.663	3.99 ± 0.677
<i>Dim. 2</i>	4.18 ± 0.725	4.17 ± 0.693	4.28 ± 0.691	4.21 ± 0.701
<i>Dim. 3</i>	3.78 ± 1.040	3.87 ± 0.853	3.87 ± 0.947	3.84 ± 0.946
<i>Dim. 4</i>	4.28 ± 0.825	4.22 ± 0.524	4.23 ± 0.745	4.24 ± 0.706
<i>Total</i>	4.06 ± 0.963	4.06 ± 0.691	4.08 ± 0.875	4.07 ± 0.782

What previous tables show is that there is very little improvement in the overall SR of the student from the initial questionnaire. The results show that the assumption made in the first place was not true; that is, students SR can not be changed by just assigning one/two/three papers to students. At least with the data used in this research. There can be multiple reasons for that. Firstly, students were given an assignment randomly, and not one type three types. Secondly, the study was based on just three assignments made in a subject, it probably will need more time to students change it perception of SR.

If results from the likert-type questionnaire are compared to the initial ones, some changes can be observed. On one hand, students acknowledge that they do make enquiries to Wikipedia a little more often, although the change is small. However, there is a change in the reliability, all three types of articles (general, civil engineering and hydraulic works) seem to gain reliability for students. This may be related to the obligation students had to include references in their works, or even the understanding of how Wikipedia is edited.

On the other hand, students now consider to a greater extent that they work has improved compared when made public on Wikipedia. It also has decreased the discomfort feeling when their work was made visible to everyone. Students also continue considering that the new type of assignment requires more work compared to the traditional one.

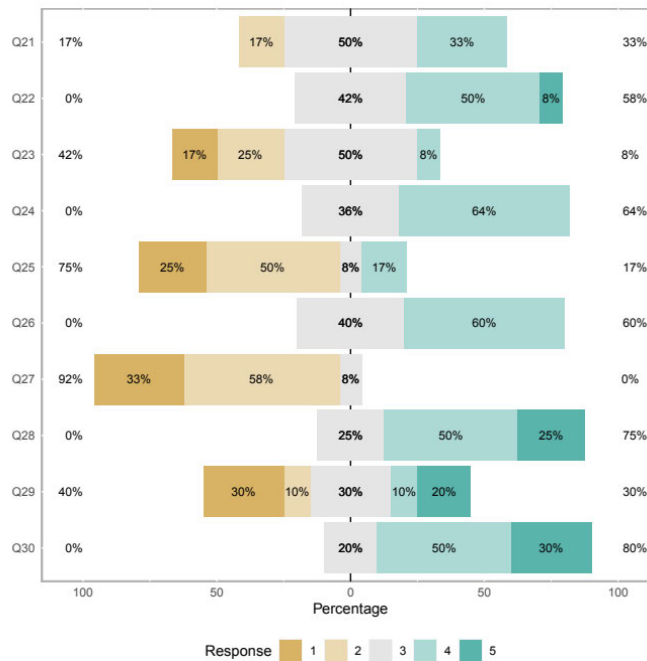


Figure 3. Barplot for the additional likert-type questionnaire answers on week 14.

4 CONCLUSIONS

This study has analysed the influence that an assignment published on Wikipedia can have on a university student's social responsibility. The study has been done with student of a Civil Engineering degree, during the fifth semester. The study was based on the assumption that the SR of students could improve if the students made a contribution to society in the form of knowledge, at the same time they deepened into topics related to hydraulic engineering.

The results showed that the analysed assignment had no influence on the SR of the student. In spite of this, further analysis should be encouraged, for example increasing the frequency of the work and duration of the study. However, the study revealed some interesting data related to this type of assignment. Students seem to try harder when the work is visible to the general public, they considered they were required to work harder and, thus, they indicated Wikipedia format improved their work.

On the other hand, and although not measured, it could be interesting to see how other generic skills of the students are influenced when their work is made public, such as students writing skills, or research skills. It has been interesting to see how students feelings changed from quite uncomfortable to less uncomfortable at the end of the study. That may help the students, as they are not used to discuss their work in public, although, as civil engineers, they should.

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