To What Extent Students' Epistemic Beliefs Influence Their Engagement in Argumentative Discourse and Attitudinal Change

Omid Noroozi, Tarbiat Modares University, Tehran, Iran, Wageningen University, The Netherlands, omid.noroozi@wur.nl
Javad Hatami, Tarbiat Modares University, Tehran, Iran, j.hatami@modares.ac.ir
Martin Mulder, Wageningen University, The Netherlands, martin.mulder@wur.nl
Harm Biemans, Wageningen University, The Netherlands, harm.biemans@wur.nl

Abstract: This study investigates how students with various epistemic beliefs engage in argumentative discourse and shift their attitude within a digital dialogue game. Participants were randomly assigned to groups of four or five and asked to argue and explore various perspectives of four controversial issues of environmental education in four consecutive weeks that each lasted 90 minutes. Epistemic beliefs of students were seen to be an important factor for the way they engage in argumentative discourse and also their attitudinal change.

Keywords: attitudinal change, epistemic beliefs, learning, argumentation

Introduction

Argumentation is a vehicle for collaborative learning process not only for traditional forms of classrooms but also for blended and online learning settings such as open and distance learning programmes in higher education (see Noroozi et al., 2012). Argumentation is considered to be significant to education due to the importance of discourse in the acquisition of scientific knowledge (see , Noroozi et al., 2013b, 2017; Osborne, 2010).

An important factor for the extent to which students engage in, or avoid, critical reasoning and arguments is their epistemic beliefs (see Nussbaum et al. 2008). Epistemic beliefs colour student interactions within argumentative discourse, leading some students to hold back from interactions. Epistemic beliefs can be defined as one's own opinion on the nature, structure, and certainty of knowledge and justification for knowing with regard to knowledge acquisition (see Hofer, 2000; King & Kitchener, 1994). From this perspective, students' epistemic beliefs can be labelled as: (a) absolutism, (b) multiplism, and (c) evaluativism. Absolutists view knowledge as objective, simple, certain, and fixed that cannot be changed meaning that there is only one right or wrong answer and only authority figures have those answers. Multiplists perceive knowledge as subjective and contextual where viewpoints are seen as mere opinions. In this case, students are exposed to various perspectives of the issue at hand with the aim of concluding that one point of view is as good as another. In the most developed and sophisticated scenario, evaluativists perceive knowledge as verified true belief meaning that there are multiple possibilities in which knowledge claims must always be evaluated for their quality of arguments in different contexts (see Muis, 2007). Scientific empirical evidence has shown that students engage in argumentation differently with respect to their epistemic beliefs. For example, multiplists are less critical regarding inconsistencies and misconceptions and less interactive with their partners than other belief groups (Nussbaum et al. 2008). It is also shown that evaluativists are more critical and active in eliciting information from their partners (Nussbaum et al. 2008), compared with absolutists who are less inclined to explore alternative solutions (Oh & Jonassen, 2006).

Epistemic beliefs can therefore be seen as a factor that influences the way students engage in argumentative discourse and critical discussion and reasoning (see Noroozi, 2016). Prior research has not investigated the effects of epistemic beliefs on student argumentative discourse when student willingness to argue is enhanced by such activity design. The picture is also unclear in terms of whether confrontation of students with various viewpoints during argumentative discourse lead to modification of their attitudes towards the topic(s) of discussion. With regard to willingness to argue, since argumentation and debating involve social learning processes (O'Keefe, 1982) and guide student attention towards exploring various sides of issue at stake (Noroozi et al., 2011, 2013a, 2013c; Nussbuam et al., 2008), we hypothesise that students' attitudes towards controversial issues would be modified after the discourse. The goal of this study is to explore how students with various epistemic beliefs engage in argumentative discourse by exposing them to controversial topics and conflicting views within a dialogue game which is fun to play, but encourages challenges. Furthermore, we explore the role of students' epistemic beliefs on their attitudinal change.

Methods

The study took place at Wageningen University in the Netherlands. The participants were 29 MSc/BSc students who enrolled for the 168-h course "Applied Environmental Education and Communication". The mean age of the participants was 23.34 (*SD* = 2.71). About 59% of participant were female and 41% of participants were male. Participants were divided into groups of four or five students on a random basis. The topic for discussion was different for each week. The dialogue game took place in four consecutive weeks providing that each week one of the main themes of the course is touched through the dialogue game. The students' task was to read materials, discuss, and argue the topic with other members in the group while taking into account the various perspectives on the need – or lack thereof – of the topic of the discussion for each week.

The learning partners in each group were distributed over different locations of a classroom. The digital learning environment was called "InterLoc" which is a synchronous text-based discussion board. InterLoc stimulates dialogue between group members in an active and structured environment by guiding students think and reason together. A variety of sentence openers are embedded in the InterLoc for provoking and promoting students' reasoning and the argumentative dialogue processes and practices of the players. For example, 'I agree because...' encourages a player to provide fully reasoned agreement. Other types of sentence openers deal with statements, evidence, support or criticism, and conclusions. Furthermore, a key feature of the game is the list of suggested openers for players' reactions to others, dynamically based on what has gone before. The list of replies is derived from a conception of how a well-reasoned discussion should proceed, e.g. from statements to fuller explanations, and from evidence to deriving justified conclusions. The epithet of a 'dialogue game' accurately describes the interactions within the discussion, as in a game there are rules about what dialogue moves can be made at different times, and so it is with InterLoc (see McAlister et al., 2004; Ravenscroft & McAlister, 2006).

One week prior to the start of the dialogue game, students were asked to complete several questionnaires through the online survey (30 minutes) on demographic variables, preliminary environmental attitude and their epistemic beliefs. The dialogue game was conducted in four consecutive weeks that each lasted 90 minutes. The first week of the study lasted almost 140 minutes. This was due to the introductory verbal explanations on the purpose of the game by the researcher (10 minutes) and students orientation and acquaintance to the InterLoc with its functionalities followed by a short 'hands-on' training exercise (40 minutes). Then, the dialogue game began and lasted 90 minutes. The second and the third sessions lasted only 90 minutes because there was no need for the introduction, orientation, and acquaintance to the InterLoc anymore. The last, forth, session lasted 140 minutes again. The dialogue game (90 minutes) was followed by a 10 minutes break. Students were then asked to state their environmental attitude positions on controversial issues that were touched during the four-week dialogue game (10 minutes). Finally, there was a plenary verbal session in which students expressed and shared their opinions on their experiences using the game with fellow classmates and also the teacher and the researcher (30 minutes).

Measurements

A pre-test post-test questionnaire was used to measure students' attitudinal change on the environmental issues that were touched during the four-week dialogue game sessions. This questionnaire consisted of two questions for each session (in total eight questions) on a five-point Likert scale ranging from "strongly disagree", "disagree", "neutral", "agree" through to "strongly agree". Specifically, both in the pre-test and post-test, each student was asked to indicate the extent to which s/he agreed with the environmental attitude statements (see Table 1). The data from post-test was compared with the pre-test data in order to detect any shift of the student attitude towards environmental issues. For each question, there could be a maximum of four-point shift (for example from strongly disagree to strongly agree and vice versa) on the environmental attitude on the basis of the Likert scale. Taking into account the five-point Likert scale together with the total eight questions on the environmental attitude, as a maximum, 32 points could be scored by each student.

We measured students' epistemic beliefs using a 15-item instrument developed by Kuhn et al. (2000) according to the judgement domains. Based on the data from this questionnaire, each student was classified into three epistemic orientations: Absolutists, Multiplists, and Evaluativists (see Kuhn et al., 2000; Nussbaum et al., 2008). An Absolutist believes that only one answer could be right. A Multiplist believes that all opinions can be equally valid. An Evaluativist believes that criteria exist whereby opinions/judgements can be evaluated and one can be shown to be better than another.

A content analysis coding scheme was adapted to measure quality of argumentative discourse activities (see Weinberger & Fischer, 2006). Every message posted during the discussion was coded as one of the following: externalization, elicitation, agreement, integration, disagreement, off task (Noroozi et el., 2016).

Findings and discussions

There were a total of 2927 discussion messages generated during the discourse, with an average of 103.76 per student (SD = 35.53). 909 messages were categorized as externalization, 455 as elicitation, 900 as agreement, 341 as integration, 294 as disagreement, and 28 messages as off task. Each student in average produced 31.34 (SD = 9.70) externalization messages, 15.69 (SD = 12.37) elicitation, 31.03 (SD = 14.05) agreement, 11.76 (SD = 6.07) integration, 10.14 (SD = 5.62) disagreement, and only .97 (SD = 1.50) off task messages.

The results show that 18 (62%) of the participants were classified as Multiplist, 11 (38%) as Evaluativist and none as Absolutists. MANOVA repeated measurement test showed that Evaluativists engage in argumentative discourse in a different style than Multiplists do, Wilks' $\lambda = .64$, $F(1, 25) = 2.02$, $p < .1$, $\eta 2 = .35$. Specifically, Evaluativists produced higher number of externalization messages (M = 35.82, SD = 8.57) compared with Multiplists (M = 28.61, SD = 9.54); $F(1, 25) = 4.20$, $p < .05$, $\eta 2 = .14$. Evaluativists also produced higher number of integration messages (M = 14.18, SD = 6.82) compared with Multiplists (M = 10.28, SD = 5.21); $F(1, 25) = 3.03$, $p < .1$, $\eta 2 = .10$. There were no differences between Evaluativists and Multiplists in terms of total number of agreement messages, elicitation, disagreement, number of messages, and producing off-task messages. The results show an effect of epistemic beliefs on the style and frequency of particular types of contribution by students. Multiplists were expected to interact less and be less critical than Evaluativists. Therefore, it was assumed that Evaluativists would produce higher number of messages and that they would mostly engage in high level of discourse transactions such as disagreement and integration. These expectations were confirmed in this study. Evaluativists produced higher number of total messages as well as disagreement and integration messages compared with Multiplists. Previous studies had found differences in the style and strength of interactions within the discussion emerging from the differences in epistemic beliefs (Kuhn et al, 2000; Nussbaum et al. 2008). Unlike our expectation and also unlike previous research (Kuhn et al, 2000; Nussbaum et al. 2008), Evaluativists produced higher number of externalization messages compared with Multiplists. One would expect that Multiplists produce more externalization messages than Evaluativists since externalizations are viewed as the least interactive category. This could be explained by the specific context of the study. The controversial issues of environmental education caused quite passionate and personal views on both side of the argument, increasing students willingness to outline and externalize their information for others regardless of their epistemic orientation.

ANOVA test showed that students' epistemic beliefs play a big role for the extent to which students change their attitude. The difference between the total number of shifts of opinions on environmental issues was statistically significant between Evaluativists and Multiplists, $F(1, 28) = 4.34$, $p < .05$. Evaluativists (M = 7.36, SD = 2.94) shifted their opinions on the environmental issues much more than Multiplists did (M = 5.16, SD = 2.64). The argumentative discourse in this study caused most students to change their positions and shift their opinions, an outward sign that the activity initiated thinking, and rethinking, among the students. This has to do with the nature of argumentation that involves social process (O'Keefe, 1982) that can facilitate students' consideration of alternative viewpoints (Nussbuam et al., 2008). The results show a strong effect of epistemic beliefs on the attitudinal change of students. The expectation was that Multiplists would interact less and be less critical of their peers than Evaluativists. It was then expected that Multiplists would be less susceptible to attitude shifts than Evaluativists. Due to more openness to persuasion and argumentation of Evaluativists compared with Multiplists, they took more advantage of the knowledge distributed in the group and integrated them with their own prior opinions to revise, modify, and adjust their initial contributions. The change between being neutral to supporting a proposal about environmental issues is a relatively large change for a student studying the topic, so none of the attitude shifts recorded were trivial or unconsidered to the students involved.

Conclusions and implications

This study used a learning activity design to engage higher education students in an intensified debate for exchanging and directing diverse conflicting opinions towards deeper reasoning and engagement using a digital dialogue game. Students' epistemic orientation was seen to be a crucial factor on their style of argumentation, engagement in the discourse, and their openness to persuasion and attitudinal change.

This study reminds us of the many variables at work within a learning design affecting willingness to argue and engagement in argumentative discourse. They include the ecological validity of the setting, knowledge and pertinence of the issue at hand, students' epistemic beliefs, and, by no means least, the style of engagement. Outcomes are not determined by one variable alone, so learning designers will need to keep in mind the full range of factors that will facilitate thoughtful and deeper argumentation.

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