

Implementing a Bilingual Text-Mining System with Hierarchical Visualization to Reflect the Changes of Learners' Understanding of Academic Integrity

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Abstract: *Academic integrity education is of concern in higher education. This research designs a learning trail to enable students to reflect their understanding of academic integrity. Students' discussion about their understanding of academic integrity before and after working with learning materials along the learning trail were collected and compared with a framework of keywords developed by the researcher via a bilingual text-mining system. The results were represented by hierarchical visualization tools for the researchers examining the differences of the representations in terms of the keywords used by students. One of the results indicated that students used more keywords about academic integrity in the dimension of values after the intervention. This study paves a way to support teachers and students to use this visualization tool for pedagogical intervention and reflection respectively.*

Keywords: academic integrity, framework of keywords, hierarchical visualization, learning trail, text-mining system

1. Background of Study

There is growing interest on research into academic integrity education in higher education. Related literatures have been emerging and increasing since the last decade (Macfarlane, Zhan, & Pun, 2014). This may be attributed to the ease of accessing and using information online in the digital era (Ercegovic & Richardson, 2004). In order to address the growing concern of academic dishonesty, this study proposes the design of a learning trail to draw the attention of students to realize the importance of academic integrity in their study in higher education. Students were asked to reflect their understanding of academic integrity in the language that they are competent, that is either English or Chinese in the local context. The pre-intervention and post-intervention reflections from students were then analyzed by a bilingual text-mining system for comparison.

2. Literature Review

Research into academic integrity is widely published in academic journals. Literature review shows that there is an array of concepts about academic integrity and it is not easy to identify a simple definition. East & Donnelly (2012) defined the means of academic integrity as being honest in academic work and taking responsibility for learning the conventions of scholarship. Gynild & Gotschalk (2008) adopted the Oxford English Dictionary to define "integrity". An ethically sound environment is then considered, in which students can be trusted to complete their work according to the rules and guidelines provided by the instructor or institution without deviation from rules and guidelines to gain advantage over others (Gallant, 2007). Some researchers conducted reviews in the area of academic integrity to obtain deep understanding of this issue. Macfarlane, Zhang & Pun (2014) reviewed 115 articles derived from both Western and Chinese literature. Their study found that much of the literature shows negative framing of academic integrity as misconduct or academic corruption with research ethics as the dominant focus. Jordan (2013) developed a taxonomical approach to his literature review to clarify the concepts of academic integrity and related terms such as academic ethics, academic dishonesty, research integrity, scientific integrity.

3. Framework of the study

Macfarlane, Zhang & Pun (2014) pointed out that the root of “integrity” in English derives from the Latin words “integer” and “integritas” with the meaning of whole or entire. In moral sense, “integrity” is associated with the virtues to be a “good” person. Besides, they considered the word “academic” as activities with three component functions: teaching, research and service (Cummings, 1998). “Academic integrity” was defined as the values, behavior and conduct of academics in all aspects of their practice including teaching, research and service. A framework of keywords on academic integrity is constructed in this study with reference to these studies. “Academic integrity” is defined with two key topics “academic” and “integrity”. The concept of “academic” is further divided into three sub-topics as “learning or teaching”, “research” and “service”. For the topic of “integrity”, the sub-topics of “values” and “behavior” are proposed. For each sub-topic, a set of keywords are incorporated to examine students’ understanding on academic integrity as shown in Figure 1. These keywords are constructed with support from literature and the keywords mentioned by students in the learning process and reflection about academic integrity.

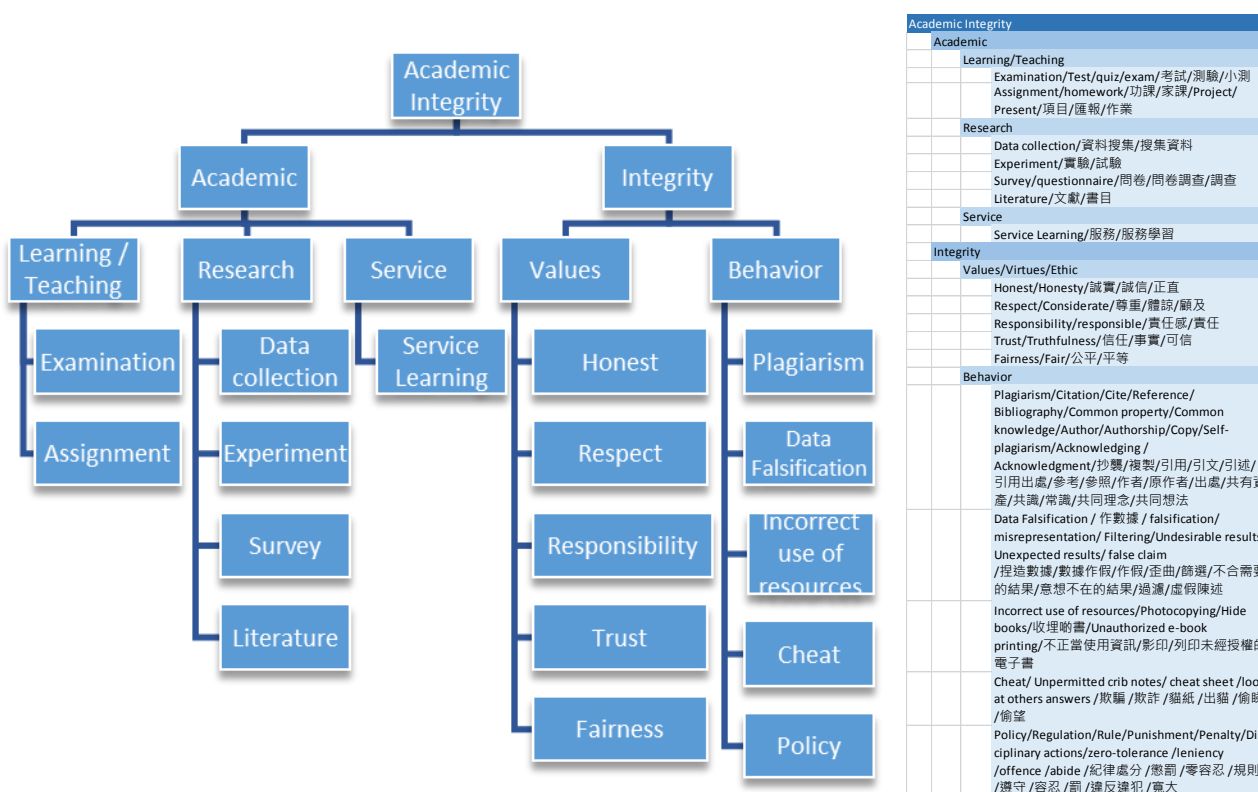


Figure 1. Hierarchical structure of topics and sub-topics in the framework of academic integrity (left) and keywords developed under each sub-topics (right).

4. Methodology of the Study

A class of 33 students participated in this study in a course about e-Learning. Students were required to install a mobile app called Mobxz in their own mobile devices and brought it along in working with the learning trail. There were four checkpoints in the trail. A map was given to students to provide information about the checkpoint locations. When students arrived each checkpoint, they could use the activation tools embedded in the app such as image recognition, GPS and/or QR code to activate the related content provided by the teachers. After successful activation, a real-life situation story about academic integrity was shown. Students were asked to make a decision if they met the same dilemma about the breaking of an academic integrity situation. For example, Amanda passed by the Statue of Dr. Sun of the campus and saw the quote “天下為公” (The World for All) on it. She wanted to include this phrase in her

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essay but she doubted if citation was needed. Students had to choose “Yes”, “No” or “Unsure” in this scenario. After student making a decision, related content would be introduced to students to support a reflection on their understanding of academic integrity. In addition to the support of the learning trail with cases for students to reflect on the behavioral aspect of academic integrity, two supplementary worksheets were designed for students to reflect about the values aspect of academic integrity during and after working with the learning trail. The worksheets contained two sessions, which helped students to learn the values and concepts of academic integrity. In the first session, students were asked to fill in the blanks about the concepts of academic integrity as shown in different context after reading a passage. In another session, students had to think of the values of academic integrity violated in the above four stories together with other supplementary scenarios after discussing with their groupmates. Example questions were: what values of academic integrity were breached if a student asked a friend for his/her login ID and password for downloading an e-book without paying for the e-book? In order to examine their learning outcomes, students were required to write their understanding on academic integrity in the Moodle discussion forum before and after the learning trail. The discussions were collected and analyzed by a bilingual text-mining system developed in this study which extracted Chinese and English vocabularies in students’ discussion and compared with the keywords in the designed framework. The matching of Chinese and English keywords was validated by the teachers when the bilingual text-mining framework was developed. The results were presented by a hierarchical visualization tool, of which the diagrammatical results could be viewed using mobile devices, for easy comparison.

5. Result and Discussion

There were 24 students responded both to the pre-intervention and the post-intervention discussions in Moodle forum respectively. The responses were analyzed and presented by a hierarchical visualization as shown in Figure 2.

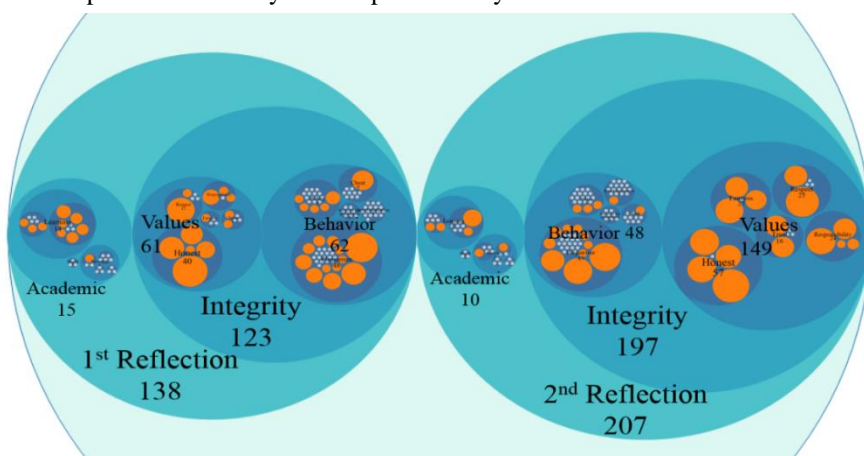


Figure 2. Results on understanding of academic integrity were shown in left circle and right circle for the first and second reflections respectively. Matched and unmatched keywords were shown in orange and grey circles respectively.

The reflections of students in pre-intervention and post-intervention on their understanding of academic integrity were shown on the left circle and right circle of Figure 2 respectively. There were 137 and 207 times matching between the keywords and students’ pre-intervention and post-intervention reflections respectively. The topic regarding to the “values” of academic integrity showed the most significant increase in the number of matching, i.e. from 61 times to 149 times. Among the “values”, “responsibility/responsible/責任感/責任” (from 6 times to 24 times), followed by “fairness/fair/公平/平等” showed the greatest increase (from 40 times to 57 times). The increase indicates that students pay more attention to the values aspect of academic integrity after the intervention.

In contrast, it was found that the number of matching reduced in some keywords in the post-intervention reflection. For example, the keyword “抄襲” only appeared 12 times in the post-intervention reflection as compared to 16 times in

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the pre-intervention discussion. This may be explained by the fact that students described the same issue in different ways between two reflections. Another possible reason is that students were reflectively engaged throughout the learning activities and that they established some higher-order concept of academic integrity such as considering the values aspect of academic integrity as reflected in the results of the increase of keywords in this topic. After the intervention, students focused not only on the behaviors such as plagiarism of academic integrity but also the values embedded which met the objective of the intervention. Finally, some keywords were seldom or even not mentioned by students in both the pre- and post-intervention reflections such as the topics about “incorrect use of resources” and “data falsification”. This showed that the intervention might not make sufficient effort in these areas to draw the attention of students to take note in these areas. Therefore, this bilingual text-mining system with hierarchical visualization provides a tool for teachers to make informed pedagogical decision-making.

6. Conclusion

This study proposes an interactive way for students to reflect academic integrity through studying case studies in a learning trail with supplementary materials to support reflection. The analysis showed that students covered more keywords on academic integrity designed by the teachers after the intervention. This bilingual text-mining system with hierarchical visualization tool allows teachers and students to reflect on their teaching and learning respectively. The main contribution of this study was to enable students and teachers to mutually understand the gap between the collective understandings of these two stakeholder groups in terms of academic integrity. The next step of using this hierarchical visualization result is to release the bilingual text-mining result to teachers and students immediately after finishing the pre-intervention reflection. A scoring rubric will be defined to assess the pre- and post-intervention reflections for scoring comparison. This step helps teachers and students to understand the collective strengths and weaknesses of students’ understanding on academic integrity using the framework defined by teachers using the result of the bilingual text-mining analysis. This step enables teachers to make pedagogical decision to adjust the content of their intervention. It also enables individual student to compare his/her reflection with the framework as well as the group understanding of the selected topic. With this regard, students would be more aware of the related concepts to be addressed in the selected topic as well as can pay attention to what their learning peers are thinking in the selected topic of reflection.

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