Penerbit Akademia Baru

Journal of Advanced Research Design

Journal homepage:
https://akademiabaru.com/submit/index.php/ard
ISSN: 2289-7984

Academic Integrity Elements using Technological Media Tools in Peer Assessment Implementation: Fuzzy Delphi

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ARTICLE INFO

Article history:
Received 13 January 2025
Received in revised form 14 March 2025
Accepted 2 May 2025
Available online 16 May 2025

Keywords:
Academic integrity; peer assessment; technological media tools; Fuzzy Delphi

ABSTRACT

In recent years, there have been many concerns about issues related to integrity and ethics among students when completing tasks using technological media tools. Peer evaluations indirectly influence early moral representations through other people's evaluations of their self-representations while interacting with others. This research aims to explore the element of academic integrity using technological media tools in peer assessment implementation. The expert participants for this Fuzzy Delphi study were selected using purposive sampling. A questionnaire was used to obtain the consent of 15 experts in the field of technology education and classroom assessment related to academic integrity elements using technological media tools in peer assessment implementation. The data from this research has been analysed using the Fuzzy Delphi formula. These results show that the five (5) elements of academic integrity: attitude, personality, behaviour, commitment and professional practice have been approved by experts as elements of academic integrity using technological media tools in the implementation of peer assessment. Therefore, peer assessment boosts students' confidence and encourages healthy discussion.

1. Introduction

Education 4.0 focuses on the student's skills development in solving problems, facing challenges, thinking critically and being independent and innovative. Teachers and mentors act as facilitators and encouragers. The emergence of Education 4.0 upgrades the Malaysian education system to face the Industrial Revolution 4.0 by taking advantage of the development of educational technology. Technology is crucial in the education field because allows students to learn without the limitations of time and place. Technology also makes it easier for students to obtain a wide range of information, knowledge and learning experiences compared to the traditional education system that is focused on the classroom. The integration of educational technology and a well-designed teaching system has the potential to support the development and assessment of 21st-century skills [1]. Nowadays, students will have easier access to computers and the internet, worldwide web-based learning,

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https://doi.org/10.37934/ard.131.1.1725

videos and various social media platforms [2]. Therefore, technology makes education more flexible, interesting and effective. Education is evolving according to current needs. Therefore, classroom management tools have become one of the crucial requirements for teachers in increasing the active involvement of students throughout the teaching and learning activities [3]. In the world of education, peer assessment has been widely used to improve the quality of student work such as the active and interactive participation of all students in the classroom, training and preparation for self-monitoring and self-regulation in education like social control in the classroom [2].

Peer assessment is an assessment method where students assess other students. This learning innovation has a positive effect on students' motivation and self-learning. In peer assessment, students give feedback or rate their work and the work of their peers. Peer assessment boosts students' confidence, encourages healthy discussion and helps them develop communication skills [4]. Students use peer assessment to provide feedback to other students regarding the quality of their work. Peer assessment encourages collaborative learning and the exchange of ideas. Peer assessment helps students develop some critical skills. The learning process is enhanced and students gain a sophisticated understanding of learning objectives [5]. Students learn a lot from their peers so using peer assessment increases the opportunity to learn [6]. This encourages students to take ownership of their learning and be more involved in the learning process. Therefore, another benefit of peer assessment is that it makes the assessment process more transparent. Peer assessment gives students an overview of what teachers need to consider when marking work [7]. Because of this, they can better understand academic requirements. Students who evaluate their peers' work learn more effectively. Using peer assessment helps students to deepen their understanding of the subject. Have students review assignments, cross-check class tests or their peers' lecture notes [8]. Discussion-based activities are an effective method for analysing gaps or differences in understanding. Peer assessment has many benefits for students and teachers [9]. It makes learning more interesting and helps develop a number of skills including communication. Teachers should manage it carefully with planning and consideration. Finally, use peer assessment with other methods such as self-assessment.

This problem can have a big impact on the human capital that will be born if this problem of integrity and ethics is taken for granted by all parties. This problem is because integrity and good ethics are crucial elements in producing people who are pious, responsible and honest in carrying out their duties regardless of the position held in the future. The biggest integrity problem that needs serious attention is the act of copying and pasting. It seems to be a culture of guilt-free students. This act symbolizes an attitude of not wanting to think about producing one's work or generating one's ideas. The next issue of integrity is the ease with which students plagiarize the work of others and claim personal ownership. As a student, will not run away from doing assignments that require us to refer to books, websites, journals and magazines. Students are more likely to cheat and plagiarize because they do not have the ability or information to tackle the assignment. This study aims to identify elements and aspects of academic integrity using technological media tools in peer assessment implementation.

2. Methodology

The sample for this Fuzzy Delphi study was selected using purposive sampling. The respondents of this study were selected based on several criteria set by the researcher to achieve the study goals. In addition, this selection is also in line with the ethics of the study, which means that the selected respondents are willing and agree to be involved in this study. As the opinion of Fraenkel *et al.,* [10] stated respondents need to be interested and express agreement to be directly involved in a study.

When there are similar criteria or high uniformity regarding the experts who will be involved in a study that uses the Delphi method, the appropriate number of experts is 10 to 15 people [11]. The total sample for this Fuzzy Delphi study is 15 experts in the field of technology education and classroom assessment related to the academic integrity elements using technological media tools in peer assessment implementation. The Fuzzy Delphi study is an integration of the Delphi study and the Fuzzy set concept. As stated by Aliev *et al.,* [12], the first step before using the Fuzzy Delphi method is to design a questionnaire. The researcher has developed a questionnaire that is the instrument of this study. The data from this study was analysed using the Fuzzy Delphi formula.

3. Results

A questionnaire was used to obtain the consent of 15 experts in the field of technology education and classroom assessment related to the academic integrity elements using technological media tools in peer assessment implementation. The findings of the analysis of academic integrity elements using the Fuzzy Delphi formula in Table 1 show that five (5) academic integrity elements using technological media tools in peer assessment implementation have threshold values (d) less than or equal to 0.2 and the percentage of expert agreement is over 75%. This result shows that the five (5) academic integrity elements namely attitude, personality, behaviour, commitment and professional practice have been approved by experts as academic integrity elements using technological media tools in peer assessment implementation.

Table 1
The results of the analysis of academic integrity elements using the Fuzzy Delphi formula

Elements	Threshold Values *(d)*	Number of items ($d \leq 0.2$)	The percentage of each item ($d \leq 0.2$)	Fuzzy Score (A)	Ranking	*Percentage of expert group agreement (%)*
Attitude	0.130	15	100%	0.638	2	100%
Personality	0.043	15	100%	0.685	1	
Behaviour	0.174	15	100%	0.608	5	
Commitment	0.145	15	100%	0.623	3	
Professional Practice	0.152	15	100%	0.608	4	

Based on the Fuzzy Score (A) value, it was found that personality has the highest value of 0.685 and behaviour has the lowest value of 0.608. Accordingly, the ranking of academic integrity elements using technology media tools in the implementation of peer evaluation found that personality is in the first position, followed by attitude, commitment, professional practice and behaviour.

3.1 Attitude

The analysis findings using the Fuzzy Delphi formula found that all aspects of attitude using technological media tools in the implementation of peer assessment have a threshold value ($d \leq 0.2$) and the percentage of expert agreement is over 75%. This means that there is expert agreement on students' attitudes towards learning, students' attitudes towards peers and students' attitudes towards themselves as aspects of attitude. Teaching and learning activities in the classroom need various approaches. Students' attitudes towards learning are behaviours, actions or views towards something that can influence the increase or decrease in student achievement in learning. Therefore, students who have a positive attitude towards learning will strive to do their best and vice versa [13]. The findings of this study show that students' attitudes towards learning are one of the aspects of

the attitude of using technological media tools in the implementation of peer assessment. The results of this study support Şen [14] study that students' attitudes toward learning is one of the crucial factors in improving their academic performance which includes students' goals, motivation, problem-solving abilities and their belief in learning. The analysis results also found that students' attitudes towards peers and themselves are aspects of attitude. Peers are students or teenagers who are almost the same age as each other and tend to follow the behaviour of the group to which they belong. Students' attitudes toward peers use peers as a guide to evaluate their abilities of their behaviour, personality, skills and abilities [15]. Students' attitudes towards themselves mean that students' priority is the responsibility to always be honest with themselves [16]. Based on the Fuzzy Score (A) value, it was found that the aspect of students' attitudes towards themselves has the highest value of 0.685 and students' attitudes towards peers have the lowest value of 0.592. Accordingly, the aspect attitude ranking using technology media tools in the implementation of peer assessment found that students' attitudes towards themselves are in the first position, followed by students' attitudes towards learning and peers.

Table 2
The results of the analysis of aspects of attitude using the Fuzzy Delphi formula

Aspects	Threshold Values *(d)*	Number of items ($d \leq 0.2$)	The percentage of each item ($d \leq 0.2$)	Fuzzy Score (A)	Ranking
Students' attitudes towards learning	0.145	15	100%	0.623	2
Students' attitudes towards peers	0.152	15	100%	0.592	3
Students' attitudes towards themselves	0.043	15	100%	0.685	1

3.2 Personality

This research show that all aspects of personality using technological media tools in the implementation of peer assessment have a threshold value ($d \leq 0.2$) and the percentage of expert agreement is over 75%. This finding proves that there is agreement among experts on self-discipline, openness to experiences, risk-taking, thinking positively and tolerance of ambiguity as aspects of personality. Self-discipline is the ability to follow personally imposed rules with order and consistency [17]. Self-discipline is crucial for students to form good behaviour, avoid negative things, determine success and practice good values. Openness to experiences is the attitude of a person who is ready to listen and accept the views and criticism of others [18]. Risk-taking makes students understand that every idea needs to be evaluated for its effects and consequences [19]. Identify the risks that may occur and assess the level of the risk. If the idea has the lowest level of risk but has a positive effect on the problem, the idea should be considered. Positive thinking is a person's ability to focus on the positive side of every situation so that students can think openly in accept various views or opinions of others [20]. Tolerance of ambiguity is the willingness or brave attitude to accept the uncertainty of various attitudes and opinions of others [21]. In addition, the Fuzzy Score (A) findings found that self-discipline was ranked first and was followed by thinking positively, tolerance of ambiguity, openness to experiences and risk-taking.

Table 3
The results of the analysis of aspects of personality using the Fuzzy Delphi formula

Aspects	Threshold Values *(d)*	Number of items (d ≤ 0.2)	The percentage of each item (d ≤ 0.2)	Fuzzy Score (A)	ranking
Self-discipline	0.130	15	100%	0.638	1
Openness to experiences	0.174	15	100%	0.608	4
Risk-taking	0.195	15	100%	0.608	5
Think positively	0.145	15	100%	0.623	2
Tolerance of ambiguity	0.163	15	100%	0.623	3

3.3 Behaviour

This analysis results in Table 4 show that all aspects of behaviour using technological media tools in the implementation of peer assessment have a threshold value (d ≤ 0.2) and the percentage of expert agreement is over 75%. These findings mean that there is expert agreement on quick learner, inquisitiveness and proactive as aspects of behaviour. Quick learners have a natural curiosity that encourages them not to be afraid to ask questions to find new information and experiences [22,23]. This curiosity allows them to explore different ideas, perspectives and solutions, leading to a deeper understanding of any given topic. The findings of this study show that inquisitiveness is an aspect of behaviour. As Zedelius *et al.,* [24] explains inquisitiveness is the quality given to ask questions and intellectual curiosity or the tendency to want to know something. Proactive behaviour students can take initiative and take responsibility to get better learning results and develop valuable skills [25]. The findings of this study support the study of Chen *et al.,* [26], which found that students with proactive behaviour are more willing and open to interact with teachers and establish positive teacher-student relationships. The value of the Fuzzy Score (A) shows that the ranking of behaviour aspects using technology media tools in the implementation of peer evaluation is based on the highest to lowest value, which is quick learner, proactive and inquisitiveness.

Table 4
The results of the analysis of aspects of behaviour using the Fuzzy Delphi formula

Aspects	Threshold Values *(d)*	Number of items (d ≤ 0.2)	The percentage of each item (d ≤ 0.2)	Fuzzy Score (A)	ranking
Quick learner	0.043	14	92.31%	0.685	1
Inquisitiveness	0.152	14	92.31%	0.608	3
Proactive	0.108	14	92.31%	0.654	2

3.4 Commitment

The analysis results using the Fuzzy Delphi formula found that all aspects of commitment using technological media tools in the implementation of peer evaluation have a threshold value (d ≤ 0.2) and the percentage of expert agreement is over 75%. These finding in Table 5 means that there is expert agreement and agreement on honesty, responsibility, appreciation of the ideas of others and Effective communication as aspects of commitment. Honesty is crucial for learning because telling the truth and conducting oneself with integrity [27]. Responsibility for making students evaluate school is about much more than just knowledge and in practical terms, grades might be more important than knowledge. The research findings are in line with the study of Ayish *et al.,* [28], responsibility is essential to students and to supporting the learning of their peers. Appreciation of the ideas of others gives students a recognition of self-worth that is important in the social and

emotional aspects of student life [29]. Effective communication is the learner's ability to offer empathy, open-mindedness and useful feedback based on what he hears [30]. Based on the Fuzzy Score (A) value found that the honesty aspect has the highest value of 0.654 and effective communication has the lowest value of 0.592. Accordingly, the ranking of the aspects of commitment using technological media tools in the implementation of peer evaluation found that honesty is in the first position, followed by appreciation of the ideas of others, responsibility and effective communication.

Table 5
The results of the analysis of aspects of commitment using the Fuzzy Delphi formula

Aspects	Threshold Values *(d)*	Number of items ($d \leq 0.2$)	The percentage of each item ($d \leq 0.2$)	Fuzzy Score (A)	Ranking
Honesty	0.119	15	100%	0.654	1
Responsibility	0.174	15	100%	0.608	3
Appreciation of the ideas of others	0.163	15	100%	0.623	2
Effective communication	0.177	15	100%	0.592	4

3.5 Professional Practice

The analysis results using the Fuzzy Delphi formula in Table 6 show that the four aspects of professional practice using technology media tools in peer assessment implementation have a threshold value ($d \leq 0.2$) and the percentage of expert agreement is over 75%. This finding means that there is expert agreement on problem-solving, moral-ethics, creative thinking and critical thinking as aspects of professional practice. As Schroeder *et al.,* [31] explained moral values are relative values that protect life and respect the value of one's own life and that of others. While Greene *et al.,* [32] stated ethics are moral values in the act of doing the right thing. Based on the findings of this study, moral-ethics is one aspect of professional practice using technological media tools in peer assessment implementation. This finding supports Chowdhury [33] study which is that moral-ethics must be present in a student because this trait is needed to build a good character and it is crucial in influencing students to make the right decisions.

Table 6
The results of the analysis of aspects of professional practice using the Fuzzy Delphi formula

Aspects	Threshold Values *(d)*	Number of items ($d \leq 0.2$)	The percentage of each item ($d \leq 0.2$)	Fuzzy Score (A)	Ranking
Problem-solving	0.108	15	100%	0.654	2
Moral-ethics	0.080	15	100%	0.669	1
Creative thinking	0.145	15	100%	0.623	4
Critical thinking	0.130	15	100%	0.638	3

This finding shows that problem-solving is an aspect of professional practice. This result is in line with Škėrienė *et al.,* [34], problem-solving is necessary to understand what is happening in the environment and it is crucial for continuous improvement, communication and learning. Besides, the aspect of professional practice obtained based on the analysis results in this research is creative and critical thinking. As Larraz-Rábanos [35], seeing a deficiency as an opportunity to innovate to develop all possible solutions] explains creative thinking seeing a deficiency as an opportunity to innovate to

develop all possible solutions. According to Murawski [36], critical thinking weighs the pros and cons to narrow down the solution to the best one because it is very focused with a clear objective. The value of the Fuzzy Score (A) shows that the ranking of aspects of professional practice using technological media tools in the implementation of peer evaluation is based on the highest to lowest values, which are moral-ethics, problem-solving, critical thinking and creative thinking. This finding supports the study results of Nixon *et al.,* [37], which found that professional practice is a set of complex activities where various knowledge and skills are used with a strong value base to promote the creation of knowledge in a way that is meaningful to practitioners.

4. Conclusions

Peer assessment is a breakthrough innovation in assessment methods where students assess each other. The benefits are feedback, cognitive and metacognitive gains, motivation, collaborative learning and independent learning. Peer assessment is expected to make students more motivated to learn and improve their performance. This research aims to explore the element of academic integrity using technological media tools in peer assessment implementation. The analysis results using the Fuzzy Delphi formula show that the five (5) academic integrity elements: attitude, personality, behaviour, commitment and professional practice have been approved by experts as academic integrity elements using technological media tools in peer assessment implementation. Findings show that there is expert agreement on students' attitudes toward learning, students' attitudes toward peers and students' attitudes toward themselves as aspects of attitude. Accordingly, the aspect attitude ranking using technology media tools in the implementation of peer assessment found that students' attitudes towards themselves are in the first position, followed by students' attitudes towards learning and peers.

This research shows that self-discipline, openness to experiences, risk-taking, thinking positively and tolerance of ambiguity as aspects of personality. In addition, the Fuzzy Score (A) findings found that self-discipline was ranked first and was followed by thinking positively, tolerance of ambiguity, openness to experiences and risk-taking. Analysis results show that quick learner, inquisitiveness and proactive as aspects of behaviour. The value of the Fuzzy Score (A) shows that the ranking of behaviour aspects using technology media tools in the implementation of peer evaluation is based on the highest to lowest value, which is quick learner, proactive and inquisitiveness. The findings using the Fuzzy Delphi formula found that honesty, responsibility, appreciation of the ideas of others and effective communication as aspects of commitment. Accordingly, the ranking found that honesty is in the first position, followed by appreciation of the ideas of others, responsibility and effective communication. Besides, the results show problem-solving, moral-ethics, creative thinking and critical thinking as aspects of professional practice. The value of the Fuzzy Score (A) shows that the ranking of aspects of professional practice using technological media tools in the implementation of peer evaluation is based on the highest to lowest values, which are moral-ethics, problem-solving, critical thinking and creative thinking. Therefore, peer assessment boosts students' confidence and encourages healthy discussion.

Acknowledgement

This research was supported by Ministry of Higher Education (MOHE) trough Fundamental Research Grant Scheme (FRGS/1/2021/SSI0/UTHM/03/15).

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