The use of a Learning Management System (LMS) and information processing behaviours of special-need students in higher educational environments

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Abstract. This article discusses the early findings of a qualitative study on information-processing behaviors in using a Learning Management System (LMS) among undergraduate students with intellectual disabilities. The study focuses on how special-need students seek, discern, and make use of academic and non-academic information in the process of learning. Students with intellectual disabilities have limitations in getting and understanding lectures and instructions from lecturers or academic support staff. While the presence of a Learning Management System (LMS) highly assists students in the learning process, a specific approach must be used to cater to their needs. Data from qualitative interviews and observation of a group of students with diverse intellectual disabilities in an Indonesian university shows the evidence. The findings suggest three views of information processing abilities and attitudes toward information exhibited by students with learning disabilities.

1 Introduction

Academic learning has been challenging for special needs students and adapting to a new learning environment during and post Covid-19 pandemic certainly becomes a great inconvenience to them. Special-need students in the context of this study refer to learners at an undergraduate level with intellectual disabilities. By definition, people with intellectual disabilities are groups of individuals who exhibit below-average intellectual functioning and adaptive behaviour as the result of diverse deficiencies during the developmental period before the age of 22 [1], [2].

In terms of intellectual functioning, people with an intellectual disability possess below-standard abilities in “reasoning, problem-solving, planning, abstract thinking, judgment, academic learning, and learning from experience,” referring to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) published by the American Psychiatric Association [2]. On the other hand, adaptive behaviour is characterized by a deficiency in exhibiting personal independence and social responsibility, resulting in low social and practical skills [1], [2]. Adopting this definition, this study aims to explore the information processing behaviours of undergraduate students who are identified as special-need students and under special surveillance by the university academic support unit.

Students with intellectual disability go through distinct learning experience as their cognitive and social skills are below average. With limited intellectual functioning and adaptive behaviour, their digital literacy and information processing in learning process need special attention and further investigation within scholarly work. The past studies about school and university students’ digital literacy mainly focused on the domain of learning approaches [3], [4], [5], [6]. Yet, the same studies on special need students, especially at a higher education level remain underrepresented. Certainly, academic information processing of students with intellectual disabilities needs further investigation to contribute to the existing literature which mostly discusses it in the context of learning methods and challenges [7], [8], [9].

The preliminary findings of the qualitative data collection and analysis of this study proposes that the LMS-centred information processing behaviours of special-need students revolve around the abilities of information processing and the attitudes toward information.

2 Literature review

Studies on the use of a digital learning platform such as e-learning and digital information seeking among special-need students is prevalent. A survey of 178 university students with learning disability in Indonesia finds that the students’ satisfaction of e-learning during the Covid-19 pandemic depends on teaching presence, cognitive and social presence, and content quality [10]. The results of another survey administered to special-need students in a
higher education institution in Oman suggest that interactive content in e-learning practice helps the students to learn better [11].

Talking about a different type of disability, visually impaired students seem to be central in some special education research. A qualitative study on information seeking behaviour of visually impaired undergraduate students in Tanzania suggests that digital information sources such as e-resources and journals are less supportive in their academic work due to lack of technological infrastructure and time constraint [12]. A similar study involving 67 blind and visually impaired students shows that the special need students bear deficit of information seeking skills due to limited availability of information formats that fit their needs [13]. These two studies define information seeking behaviours in the context of students’ ability and attitudes in searching information for academic tasks and using academic resources such as books, e-repository, journals and others in the university library.

It should be noted that domain of information seeking behaviours varies from one study to another. Studies on information seeking behaviours of undergraduate students, not focusing on special-need students, explore information seeking behaviours by measuring source of information [14, 15, 16, 17], motives and barriers for information seeking [14, 17], access to information sources and satisfaction with the information quality and quantity or with service providers [15, 17]. The studies of information seeking behaviours also include Information and Communication Technology (ICT) skills, communication skills, and word processing in the study measurements [14]. Preferred formats of information and frequency of visit to library as the centre of academic information sources are also discussed in such a study [17].

Assessing special-need students’ communication skills requires direct observation to see the accurate results. Some studies employ an experimental approach to observe actual improvement of communication competence among school students with ASD and other learning disabilities. Evidence from an experiment using developmentally sequenced one-to-one educational intervention (DS1-EI) shows that pupils with ASD and intellectual disability gain more learned communication skills in natural setting of classroom under the condition of Treatment-As-Usual (TAU) [18, 19]. Another experimental study also identifies that students with severe learning disability show improvement in peer interactions within an instructional setting of classroom after being given peer support arrangements [20].

To guide in analysing the research data, a conceptual framework adopted from model of information processing [21]. This model helps to understand how humans’ brain work in receiving information through process of stimuli, perception, attention, and responses. This study proposes that students’ use of information and communication technologies (ICT) including online learning sources plays a role in assisting information processing in classroom [22].

This research essentially seeks to understand how students with learning disabilities “learn,” but it builds no connection to the concept of Visual, Auditory, and Kinaesthetic (VAK) learning styles [23]. Afterall, this theory shows insignificant relationship between learner’s sensory modalities and learning achievement, especially in language teaching scenario [24].

3 Research methodology

As special-need students need a personal approach to encourage their participation, this study employs a qualitative methodology. Involving undergraduate students with mild to moderate intellectual disability, this research expects to capture the students’ information processing in a learning context. The investigation of information processing behaviours covers their understanding of information and communication messages delivered and facilitated by the presence of digital learning tools, particularly LMS [22].

The data collected for this article is derived from a pilot study involving six students from a private university in Indonesia namely Bina Nusantara University. This pilot study serves as the preliminary investigation of the actual research on 30 students in three higher education institutions in Indonesia and Malaysia. Despite the limited number of the study participants, the analysis shows significant outcomes for further scholarly discussion and publication.

The students were selected based on the recommendation of the department where they study. The students were identified to possess learning disabilities symptoms ranging from slow learning development, deficiency in logical thinking, attention deficiency, and low understanding of social cues, to clinically diagnosed Autistic Syndrome Disorder (ASD) and attention deficit hyperactivity disorder (ADHD). These intellectual disability syndromes were associated with the definition of intellectual disabilities as suggested earlier [1], [2].

The pilot study also involved individual observation. This study employed unstructured observation by which the researchers examined the situation at the moment of data collection with unplanned mechanism [25]. In practice, the researchers asked the study participants to show how they navigate the online learning information sources they claim are more convenient to use. The observation findings serve to validate the interview responses given by the students for the purpose of triangulation.

The data were analysed using a thematic analysis approach [26]. The presentation of the findings addresses the students in an anonymous initial, age, and the type of intellectual disabilities that they possess. The statements quoted were actual evidence from empirical data collection with language adjustment in terms of grammar and translation. The data collection took place in April 2023 through one-on-one interviews in the language that the participants are convenient. Four students answered in Bahasa Indonesia, and two students speak in English.

4 Research findings

The thematic analysis produces two major findings: the abilities of information processing and attitudes towards
information. These two findings correspond with the model of information processing as proposed earlier. The ability and the attitudes of academic and non-academic information processing exhibited by the special-need students under study are conceptualized as the responses to stimuli existing in the form of design, human, and environmental dimensions. The stimuli go through cognitive processing that includes stimuli, perception, and response [21]. As a result, special-need students show certain abilities of information processing and attitudes toward information.

4.1 Abilities of information processing

The first theme of the findings discussed in this article is special-need students’ abilities of information processing. This study argues that students with intellectual disabilities show distinct information-processing abilities that are categorised into three views. The views include audio-visual processing, textual processing, and social-dependent processing of information.

4.1.1 Audio-visual processing ability

Special-need students at an undergraduate level exhibit audio-visual information processing ability in the use of a Learning Management System (LMS) and other learning mediums. This type of information processing ability is defined as the dependence on academic information in the form of audio-visual such as lecture videos, educational learning in social media, and audio or visual notes from the class. Evidence shows that the special-need students under study appreciate the presence of lecture videos on Binusmaya, the university’s in-house style of an LMS. An interviewed student said: “The video-based learning on Binusmaya helps me a lot. In F2F (face-to-face) lectures, we listen to the lecturer, take notes, and that is all. But, if it is a video, we can watch and re-watch it many times until we understand the topic” (ERL, 22, attention deficiency and slow learning case).

The audio-visual information processing ability is also apparent in the students’ behaviour of searching educational videos on YouTube. One of the students said: “I learn from PPT (Lecturer’s PowerPoint slides) and YouTube. If I do not understand how to do a (class) project, I search the video on YouTube” (JES, 22, ASD case). This shows that videos can serve as accessible learning materials for special need students with audio-visual information processing ability.

Another notable method of audio-visual information processing ability exercised by special-need students is using audio or visual notes. The students audio record the lecture in class or capture the lecture notes on the board using their smartphone to be re-observed later. Asked if they practice lecture notes writing, a student said: “(Writing notes) is not necessarily just because I need the information. I usually take a picture on the (lecture) notes” (VAL, 19, ADHD case).

Previous studies [12], [13] argue that students with learning disabilities prefer a visual form in processing information. The finding discussed in this subsection confirms that argument. In addition, this study suggests that videos, audio recordings, and still pictures also play an important role in the special-need students’ practice of information-processing ability.

4.1.2 Textual processing ability

The second view of information-processing ability exhibited by special-need students in this study is textual processing. The textual processing of academic information in the context of this study refers to the dependence of textual information either in learning materials provided in LMS or other online sources. This information-processing ability underlies the need for text-based information for lectures and assignments as well as academic services.

In terms of lecture materials, the special-need students depend on the lecture notes that are posted on Binusmaya in Microsoft PowerPoint slides (PPT) or PDF (Portable Document Format). As proof, one of the students said: “I rely on the PPTs that are available on Binusmaya from the beginning to the end of semester” (BHI, 23, ASD case). Similarly, another student who mostly accesses the LMS through her smartphone uttered: “It (the lecture note) is usually in PDF in Binusmaya. I read it directly because if I download it, my phone memory will be full” (JES, 22, ASD case).

Another medium for textual information processing ability is email. Most of the students prefer to receive information about academic services and learning materials through an email service due its user-friendliness. One of them said: “I prefer (Microsoft) Outlook to see important information. I want the lecturers to send the PPT via emails too. It is more professional, and I am more familiar with that” (NAD, 21, excessive anxiety behaviour case).

An online source such as a website serves as another medium for textual information processing ability. Asked about their preferred learning materials, a student expressed: “PPT and website (are preferable) because I can access them easily and I could find what I want to learn” (ALD, 22, ADHD case). Weblogs or informative websites which are more text-based significantly assist the students to gain information for their learning.

The fact that special-need students prefer PPT, email, and websites as the source of academic information shows that their processing ability is textual. It means that they can process information better in the form of texts. This finding corresponds to the findings of previous studies that suggest the importance of text-based sources of information [14-17].

Text-based learning materials remain important for students with learning difficulties. Evidence from the observation on how the students use learning tools shows that the presence of descriptive learning sources helps students to use them further in their study. For example, one student (JES, 22, ASD case) demonstrated how she accessed the PPT from Binusmaya and saved it in her mobile phone. She then send the PPT to her tutor to help her understand the topics of her courses. Another student (NAD, 21, excessive anxiety behaviour case) showed how she obtained information regarding lectures and semester registration via email and read the information given.
4.1.3 Social-dependant processing ability

Social-dependant processing ability serves as the third view of information-processing ability exercised by special-need students in this study. The view is defined as the form of information processing skill that requires the presence of others in the action. As special-need students, they rely on close assistance either from lecturers, peers, and/or supporting staff.

Special-need students require special treatment, and it is apparent from their need for hands-on guidance from supporting staff in the matter of academic support such as course enrolment and payment. One of the interviewed students argued: “The thing is when I don’t understand something like (registration for) a compact semester, they just give me instructions like in the email. They ask me to read it myself. I want an explanation. I need someone to guide me like how to sign up and stuff” (NAD, 21, excessive anxiety behaviour case). It is obvious that some special need students require personal aid to assist them in understanding information they need. The presence of a helpful academic and non-academic staff to facilitate their need is recommended.

The presence of others is obviously needed for both academic service and the learning process. Essentially, face-to-face (F2F) interactions are most preferred by special-need students to support their information-processing ability. Corresponding to this idea, a student uttered: “(For academic supports) I prefer F2F because I can get the explanation directly. (For learning), I prefer F2F too because it is direct” (ALD, 22, ADHD case).

The lecturer’s role in assisting students with learning disabilities plays a pivotal role in enforcing their information-processing skills. The evidence shows that students demand one-on-one sessions with the lecturer to understand the lecture better. A student uttered: “Usually, I request spare time after the lecture to have a one-on-one session with the lecturer if I feel uncertain about the topic in the class” (ERL, 22, attention deficiency and slow learning case). This is supported by another student’s statement: “I want the lecturer to come to me and explain (the topic) just for me” (JES, 22, ASD case). On a similar note, a student who attended home-schooling when in high school argued: “The thing is, if the lecturers explain in front of the class, I do not understand. So, I need to be explained separately from the others” (NAD, 21, excessive anxiety behaviour case).

Despite their lack of social skills, students with intellectual disabilities depend on other people to learn about their world including pursuing education [18-20]. The finding of this study points out the need for assistance from others in information processing behaviours as a social dependency. Hence, social-dependent information-processing skill serves as noticeable evidence of special-need students’ information-processing behaviours.

4.2 Attitudes toward information

The second theme of the findings presented in this article is special-need students’ attitudes toward information regarding academic services and the learning process. The discussion of this theme is revolved around the use of an LMS called Binusmaya. Specifically, the attitudes toward information as exhibited by the students are conceptualised in three dimensions: the need for design support, the need for peer support, and the need for lecturer support. The findings in this section support previous studies that suggest the role of peers and educators in special-need students’ information processing behaviours [18-20].

4.2.1 The need for design support

Information-processing behaviours of students with intellectual disabilities show some attitudes of need for assistance, one of which is design support. Need for design support in this context refers to the usability of the LMS in facilitating the information processing. User-friendliness and interactivity are the main concerns for special-need students to access and make sense of the information related to lectures particularly.

In terms of a user-friendly aspect, students with intellectual disabilities expect the LMS to be one-centre platform where they can get information regarding academic services and lecture materials. Asked about their concern on the LMS, a student expressed his dissatisfaction with the availability of two versions of it: “It would be better if the new Binusmaya and the old Binusmaya are combined in one portal so that it is easier to access” (BHI, 23, ASD case). Another student pointed out the multi-layered navigation that confused her: “The Outlook is better because it needs just one click to get the information. In Binusmaya, you must click many times to get into the page where the information is available” (NAD, 21, excessive anxiety behaviour case).

The interactivity in the LMS is another concern. As suggested earlier, the special-need students require presence of others to help them understand information they receive. Therefore, they need a built-in help centre in the LMS as suggested by a student: “If there is a help centre, it will be nice, for example a chat box” (VAL, 19, ADHD case).

When asked to demonstrate how the students with learning difficulties under this study access the LMS, it is apparent that interface design is essential. However, it is not about the appearance perse but most likely the functions and the menu in the LMS. The student (VAL, 19, ADHD case) pointed out that the help centre was placed hidden in the inner menu instead of on the homepage.

Despite the concerns on the user-friendliness and interactivity, the students with learning disabilities appreciate the notification feature. All of the students use the mobile version of the LMS installed on their smartphone. The push notification helps to remind the students regarding lecture schedules, project deadlines, and other information related to academic services. A student pointed out the function of the discussion forum in the LMS that serves as an online learning platform. “Whenever I receive the notification, I immediately check it (class project), especially the (discussion) forum” (JES, 22, ASD case).
4.2.2 The need for peer support

Peer support plays an important role in special-need students’ attitude toward information. The evidence shows that the students with intellectual disability in this study find their friends helpful in understanding information in the LMS. The assistance they request from their classmates include information about project briefs and group work, and validity of some information regarding academic services.

For the class project briefs the lecturers usually post them on the LMS based on the running lecture session or week. Sometimes students are confused in which session the brief is posted. For this reason, a student relies on her friend: “I usually ask X [the student mentioned the name of one of her classmates] where I can find the (PPT) slides for the project” (NAD, 21, excessive anxiety behaviour case).

In terms of group work, a student utilizes the discussion forum in the LMS to discuss with his group members. As proof, he said: “It (the discussion forum) is important especially when you have a group project” (ALD, 22, ADHD case). This particular student appreciates the presence of a discussion forum in the LMS where he could discuss a group project.

Another type of peer support needed by the special-need students is for validating the announcement regarding course enrolment or off-class activities. For example, a student expressed: “I would ask my friends first. If they are not aware, I then ask the student service staff” (BHI, 23, ASD case). In the case of this student, the role of peer support is above staff support.

4.2.3 The need for lecturer support

As argued in the first section of the findings, the lecturers’ role is crucial in special-need students’ information processing abilities. This suggests that the students’ attitude toward information is also driven by the need for lecturer support. The support is revolved around the lecturer’s way of teaching.

This study notes that the students with learning disabilities expect special attention given to them especially in class discussion. They want the lecturers to notice their existence and invite their participation in the class. As a student argued: “I prefer more discussion in the class. I expect the lecturers ask if we have a question or not. I always wait the lecturer to allow me to ask. But, I am afraid to ask first” (ERL, 22, attention deficiency and social dependency case).

It is also apparent that they demand straightforward explanation on the lecture topics and equal opportunities to participate in the class. One student expressed: “The delivery (of the lecture) must be clear, and the students are given a chance to express their ideas” (ALD, 22, ADHD case). Specifically, the explanation is particular to the language style that is convenient to them. It is proven with a statement from one of the students: “It would be better if the lecturer explains in the language that we understand using examples (of cases) that are relevant to our daily lives” (BHI, 23, ASD case).

5 Conclusion

This article discusses the information-processing behaviours in the context of learning and the use of an LMS among special-need students at a higher education level. Using qualitative interviews and thematic data analysis, the study suggests two major findings that contributes to the studies of information processing behaviours and the studies of special need students. The thesis of information processing behaviours in this article is discussed in the context of students’ abilities of information processing and their attitudes towards information.

In the context of special-need students’ information processing abilities, this study suggests that students with intellectual disabilities exhibit three approaches of information processing. The approaches include audio-visual processing, textual processing, and social-dependent processing. This thesis differs from the framework of VAK learning modalities [24].

Evidence from the study also highlights special-need students’ attitudes towards information. Such attitudes are framed in three dimensions including the need for design support, the need for peer support and the need for lecturer support. The discussion of these particular findings focuses on the use of an LMS and teaching style of the lecturers in providing information to the students.

Conclusively, this study proposes the views of information processing ability exhibited by special-need students. The views are audio-visual processing, textual processing, and social-dependent processing. Essentially, this study proposes these three views of information processing as an assessment to evaluate how students with learning disabilities seek and make sense of information. This can help educators to accommodate and prepare teaching materials that are more effective and convenient for the special-need students.

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