



Original Article

Acceptability and potential impacts of innovative E-Portfolios implemented in E-Learning systems for clinical training



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المخلص

أهداف البحث: هناك أدلة متزايدة على أن استخدام المحافظ الإلكترونية له تأثير إيجابي على خبرة التعلم. لكن، لم تظهر الأدبيات بيانات كافية عن فعالية المحافظ الإلكترونية في التعليم الطبي. أجريت هذه الدراسة لتقييم القبول والتأثيرات المحتملة للمحفظة الإلكترونية لطلاب الأشعة التصويرية.

طرق البحث: أجريت هذه الدراسة الكمية المقطعية خلال العام الأكاديمي ٢٠١٦-٢٠١٧ على الطلاب أثناء التدريب السريري. تم توزيع استبانة ذاتية على مجموعة مختارة من الطلاب. أكمل جميع المشاركين نموذج الموافقة قبل تنفيذ الاستبانة.

النتائج: من بين ٧٥ طالباً، أكمل ٦٦ الاستبانة (معدل الاستجابة: ٨٨٪). تم تحديد خبرات الطلاب، دعم التعلم للطلاب والتحديات للمحفظة الإلكترونية. اعتبر واحد واربعون طالباً (٦٢٪) أن المحفظة الإلكترونية تسهل التنظيم الفعال لعملهم، ووافق ٤٠ (٦١٪) على أن المحفظة الإلكترونية عززت مهاراتهم المهنية. في المقابل، أدرك الطلاب وجود علاقة سلبية بين دعم التعلم لدى الطلاب والاستفادة المستقبلية للمحفظة الإلكترونية. ووجد أن الاستخدام المستقبلي للمحفظة الإلكترونية يرتبط ارتباطاً إيجابياً بالتحديات والالتزام بالمواعيد النهائية، معاملات الترابط ٠.٣٧١ و ٠.١٥٢ على التوالي.

الاستنتاجات: استخلصت الدراسة أن الدعم الفني المستمر للمحفظة الإلكترونية طوال الدورة له دور محتمل في تعزيز خبرة التعلم. التدريب المناسب لدمج المحافظ الإلكترونية في التعليم والتعلم يمكن أن يؤدي إلى إثراء البيئة التعليمية. ورود فعل الطلاب وأعضاء هيئة التدريس هي حجر الزاوية الرئيس لنجاح المحفظة الإلكترونية.

الكلمات المفتاحية: المحفظة الإلكترونية؛ التعلم؛ التعليم؛ التصوير بالأشعة

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Abstract

Objective: There is growing evidence that use of E-portfolios has a positive effect on learning experience. However, literature has not shown sufficient data about the effectiveness of E-portfolios in medical education. This study was conducted to assess the acceptability and potential impacts of E-portfolio use for undergraduate radiography students.

Methods: This cross-sectional quantitative study was conducted during the academic year 2016–2017 on students studying clinical courses. A self-administered questionnaire was distributed to the selected cohort of students. All participants completed the consent form before answering the questionnaire.

Results: Of 75 students, 66 completed the survey (response rate; 88%). Students' experience, students' learning support, and the challenges of E-portfolio use were identified. Forty-one (62%) students perceived that E-portfolios facilitated the effective organization of their work, and 40 (61%) agreed that E-portfolios enhanced their professional skills. In contrast, the students perceived a negative correlation between students' learning support and future utilization of E-portfolios (correlation coefficient -0.394 , $p = 0.05$). Future utilization of E-portfolios was found to be positively correlated with challenges and commitment to deadlines, with correlation coefficients of 0.371 and 0.152, respectively.

Conclusion: The study found that continuous technical support for E-portfolios throughout the course had a potential role in enhancing learning experience. Appropriate training for integrating E-portfolios into teaching

and learning can potentially enrich the educational environment. Student and faculty feedback is the main cornerstone for E-portfolio success.

Keywords: Education; E-portfolio; Learning; Radiography

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Introduction

Recently, literature has shown a wealth of evidence that technology-driven E-learning in clinical training plays an important role in lifelong and active learning.¹ E-learning platforms give trainees the flexibility to make choices to set the pace and momentum for their learning endeavours that precisely match their learning styles.² The impact of E-learning can be enhanced by its incorporation into workplace-based learning³ and within an interprofessional and interdisciplinary environment.^{4,5} A portfolio, an integral component of E-learning, is a holistic framework that facilitates the development of professional attributes and lifelong learning capacities.^{6,7} Students' portfolios are authentic evidence of their graduate profile, clinical experiences, and achievements.^{8,9} Literature has shown that use of portfolios has improved students' self-confidence, academic achievements, and their ability to intelligently integrate theory with practice.¹⁰

With the technological developments in digital innovations, paper-based portfolios have been replaced by E-portfolios that have enormously increased accessibility and storage capacities.¹¹ Additionally, the use of technology in E-portfolios provides convenience, ease of management, and enhanced interaction among peers and teachers.¹² Such desired features of E-portfolios promote experiential learning, reflection, and self-regulation. Currently, most institutions have integrated E-portfolios into their curricula for active and effective learning of trainees.^{13,14} E-portfolios provide constructive feedback to facilitate guidance and monitor students' progress.¹⁵ E-portfolios are based on four important elements: electronic contents, learning management systems, communication, and evaluation. All elements focus on blended learning environments that promote proactive learning.^{16,17} E-portfolios can be administered on different E- platforms, but roughly all platforms have similar functionality and features such as reflective notes, learning artefact submissions, prompt feedback, and formative assessment of submitted work.¹⁸ An application or a web-based program linked to the Picture Archiving and Communication System (PACS) with the ability to upload and view video and images in the Digital Imaging and Communications in Medicine (DICOM) format can encourage professionals and students to utilize E-portfolios in their current and future careers.¹⁹

Despite the popularity and escalating application of E-portfolios in medical education, there is scarcity of data that

can reflect the acceptability and validation of E-portfolios by undergraduate students pursuing their clinical training. This study aims to investigate perceptions of undergraduate radiography students about acceptability and potential impacts of E-portfolios and their views on how they facilitate or hinder their learning in the College of Health Sciences (CoHS), University of Sharjah, UAE.

Materials and Methods

This cross-sectional quantitative study was conducted during the academic year 2016–2017 on the undergraduate radiography students of CoHS, University of Sharjah, UAE. After obtaining the institution's ethical approval, data was obtained through a self-administered questionnaire derived from previous studies.^{20,21} The questionnaire consisted of 20 statements about students' experiences using E-portfolios, the portfolios' role in supporting students' learning, and challenges faced by students during the implementation period. A 5-point scale (from strongly disagree to strongly agree) was used. The self-administered survey was presented to all 75 students who used an E-portfolio through Blackboard as a part of their clinical training. An introductory cover letter explaining the purpose and expected benefits of this survey was attached to the questionnaire. Participation in the study was voluntary, and informed consent was obtained from all participants before their participation. The participants were assured of confidentiality and their right to withdraw from the study at any time without any consequences. A pilot study was carried out to determine understandability, validity, and reliability of the questionnaire. Fifteen participants were randomly selected to complete the pilot study, and the questionnaire was accompanied by a cover letter that explained the study's purpose. Based on results and comments received from the respondents in the pilot study, minor paraphrasing and arrangement of questions were done. Data assembled from the pilot study were not included in the primary study.

The current study was conducted on students studying the module entitled 'Medical Imaging Clinical Practice', which is offered to 4th-year students of the radiography program at CoHS. This is a 4-year Bachelor of Science (Honours) undergraduate diagnostic radiography program that is spread over eight semesters and ensures construction and acquisition of knowledge from basic to more advanced levels of clinical practice.

E-Portfolio design

The E-portfolio workspace was specifically designed for the medical diagnostic imaging clinical practice courses, as per the requirements of each clinical course. As the clinical focuses and course requirements vary between the departments, there was no collaboration with other departments involved during the development and implementation phase. Nevertheless, it is worth noting that the E-portfolio could be refined according to the requirements of each department. A tailored E-portfolio system was designed based on a needs assessment²² performed by the Information Technology and Learning Management

System (LMS) team at the University of Sharjah. Afterward, it was integrated into the Blackboard Learning Management System (LMS) of CoHS.

The design of this E-portfolio in the Blackboard LMS allowed access to clinical practice courses in the undergraduate radiography program and permitted students to archive contents and access them even after their graduation for their professional development. This E-portfolio offered services for the creation, management, presentation, and sharing of learning artefacts, and the end users were able to access the E-portfolio through the university website using their unique identification codes and password. Students were instructed to submit their learning artefacts in different formats such as Word, PDF, or images utilizing Blackboard assignment and survey tools. Faculty members and instructors used evaluation rubrics to provide instant assessment or request more details and information about the submitted materials. Students and faculty were able to communicate through E-portfolio-automated emails or in the discussion boards. Additionally, faculty had control over content, user profiles, privacy policy, emails, and backup of the E-portfolio.

Implementation

The rationale for introducing the E-portfolio was based on improving the learning process and engaging students in their studies. Additionally, due to the increased number of students, the department thought it was a meaningful way to reduce the problem of storage and archiving students' portfolios. E-portfolios are cost-effective and environmentally friendly. Moreover, E-portfolios enable effective reflection and constructive feedback, which are important aspects in clinical training. The integration of E-portfolios in the radiography curriculum was done throughout five clinical courses offered by the department during the study period. To ensure proper implementation of the E-portfolio, aims and objectives were well explained to the students and faculty in an orientation session and training workshop. Moreover, clear guidelines on requirements, word limits and expected time commitments were embedded in the system. E-portfolios were used for summative and formative assessments such as grading and marking the students' work. The assigned clinical instructors were responsible for summative assessment and for providing feedback during formative assessment. The implementation was preceded with an. Technical support was offered to all users throughout the implementation period.

Data analysis

Data generated from the questionnaire were coded and entered into SPSS for Windows (version 23.0). Both descriptive and inferential statistical analyses were applied for detailed analysis of responses. Descriptive analysis was done through frequencies of E-portfolio statements that were represented graphically in the form of bar and pie charts. Moreover, in the inferential analysis, correlation and regression analyses were used to explore the relationship between future use of E-portfolios and experience, learning, and challenges associated with them. The level of significance in this study was 5%.

Results

Seventy-five students were invited to participate in the study and 66 complete responses were received from the participants, constituting a response rate of 88%. Students' perceptions regarding E-portfolio statements are presented in [Figure 1](#). The majority of the students (44, 62%) perceived that E-portfolios facilitated effective organization of their work. Likewise, 40 (61%) students perceived that E-portfolios enhanced their professional skills. Twenty-three (35%) students had mixed responses regarding the role of E-portfolios in developing their creativity.

[Figure 2](#) presents the students' responses regarding their likelihood of using E-portfolios in the future. The majority of the students (36, 55%) were convinced that they were willing to use E-portfolios in their next clinical work. Interestingly, 36 (55%) students had used paper portfolios before, while only 6 (9%) had used E-portfolios before this survey. [Figure 3](#) illustrates various devices used for E-portfolios in this study and indicates that the majority of the students used laptops for E-portfolio learning.

[Table 1](#) shows descriptive statistics of the students' perceptions about E-portfolios. Statistically, three categories of variables were clustered: E-portfolio experience (9 statements), E-portfolio supports to students' learning (8 statements), and challenges (2 statements), with Cronbach's alpha values of 0.80, 0.82, and 0.83, respectively, which exceed the cut-point value of 0.7. Thus, these variables could be reliably used for further analysis. Additionally, [Table 1](#) also provides the average, minimum, maximum, and standard deviations of all scales that were used in this study.

In inferential statistics, correlation and regression analyses were applied. [Table 2](#) provides the correlation analysis between future utilization of E-portfolios and the three variables (students' experience, support to students' learning, and challenges of E-portfolio use). The results showed that there was a negative relationship between students' experience and future utilization, with a correlation coefficient of -0.515 , statistically significant at a 5% level of significance. Furthermore, the students perceived a negative relationship between E-portfolio supports to students' learning and future utilization of E-portfolios, as the correlation coefficient was -0.394 with a statistical significance level of 5%. Meanwhile, future utilization of E-portfolios was positively associated with challenges and commitment to deadlines in E-portfolios, with correlation coefficients of 0.371 and 0.152, respectively. It was evident that the challenges of using E-portfolios had a positive and significant correlation with future utilization of E-portfolios, with a 5% level of significance. Students perceived that the use of E-portfolios in the future was associated with more challenges that could help them develop their professional skills.

Correlation analysis provides information on the relationship between future utilization of E-portfolios and students' experience, learning support for E-portfolios, and challenges of using them. However, it does not provide the magnitude of the relationship. To predict the magnitude of the relationship between future utilization of E-portfolios and these defined variables, a regression analysis was

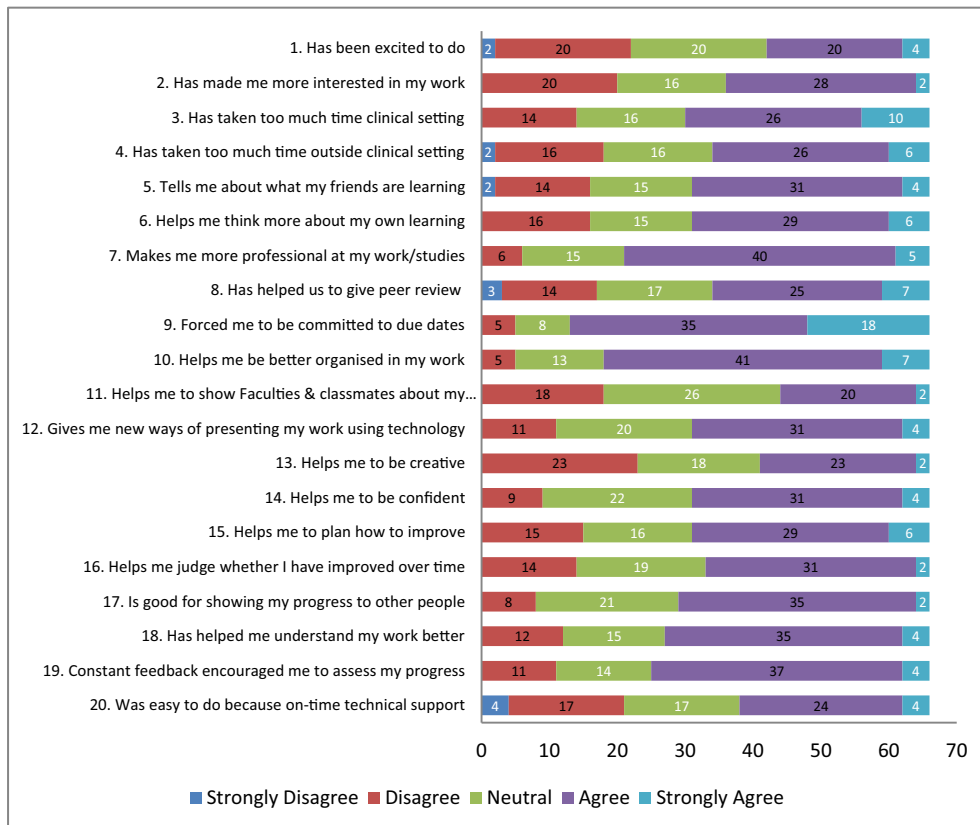


Figure 1: Students' perceptions about E-portfolios in this study.

applied. This is shown in Table 3. The results showed that future utilization of E-portfolios was positively associated with challenges and commitment to deadlines in E-portfolios, with the highest coefficient values of 0.29 and 0.250, respectively. The students' responses showed a positive correlation between E-portfolio learning and its future utilization (the coefficient value of 0.13 was not statistically significant). Thus, students perceived that use of E-portfolios was associated with more challenges.

Discussion

The purpose of this study was to investigate students' experiences using E-portfolios used in clinical practice courses and define how they facilitate or hinder students' learning.

Descriptive analysis revealed that the students had mixed experiences. They believed that E-portfolios helped them develop their self-awareness and self-assessment skills, as they were able to judge their progress, become more confident, and develop planning skills. Literature suggests that grooming such professional traits contributes to students' lifelong and experiential learning,^{10,21,23,24} as the learning capacity of E-portfolios increases when students engage in continuous self-assessment and reflection.¹⁶ In contrast, the correlation and regression analyses did not show a statistically significant experience as perceived by the students in this study. The negative experience of the E-portfolio has been reported in medical education literature.²⁵ This can be attributed to the poor culture of reflective learning²⁶ and lack of awareness of standard protocols of professionalism.²⁷ However, a framework has been proposed to help students adapt to task difficulty and to encourage autonomy in the learning process.²⁸

The descriptive analysis in our study showed that the students appreciated the constructive feedback received from their teachers. Ongoing assessment and formative feedback from teachers and peers promote the culture of assessment for learning.^{29,30} Students have been reported to insist on the importance of technical support while using E-portfolios, and to believe that technical troubleshooting can be sorted out with time.³¹ This can be due to the short period that E-portfolios have been used, since they were applied during the last academic year. However, it is suggested that the challenges experienced during the implementation of E-portfolios will be minimized with more experience using

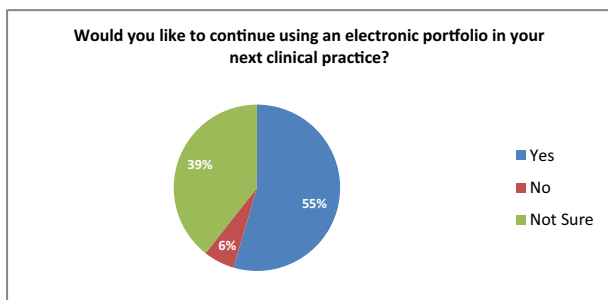


Figure 2: Perceptions about use of E-portfolios in the future.

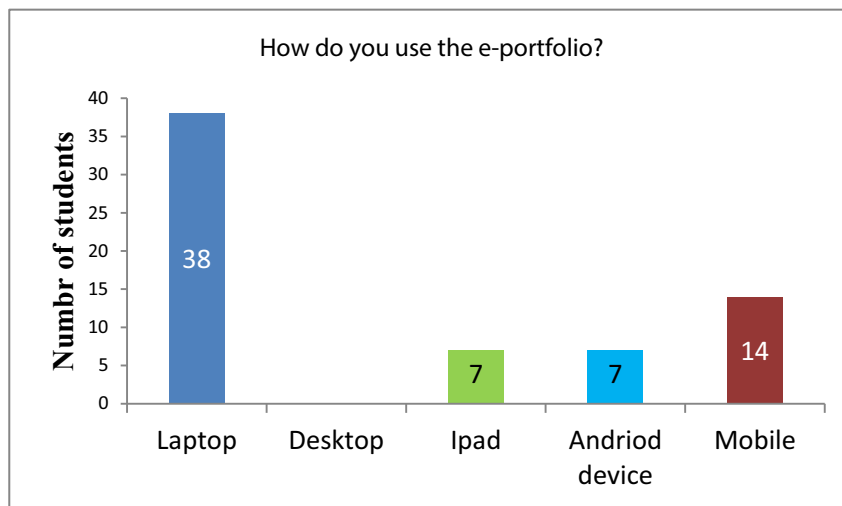


Figure 3: Source of use of E-portfolio in this study.

Table 1: Descriptive statistics of the students' perceptions about E-portfolios in this study (n = 66).

Variable	Mean	Std. deviation	Minimum	Maximum	Cronbach's alpha
E-portfolio experience	3.27	0.58	2.00	4.50	0.80
E-portfolio learning	3.42	0.60	2.25	4.62	0.82
Challenges	3.38	0.94	1.50	5.00	0.83
Future utilization	1.85	0.96	1.00	3.00	N/A

them.³² The descriptive analysis in this study revealed that E-portfolios had an impact on student learning, but it was not significant according to the correlation analysis. Similar results have been noticed in studies conducted at the undergraduate education level, as few students regarded E-portfolios as beneficial for learning.^{25,33} However, another study has proposed that the students' undergraduate experience will ease the successful implementation of E-portfolios into their postgraduate training and has the potential to promote acceptability.²⁵

The main challenge in this study was students' acceptance of the E-portfolio as a holistic approach for documenting their learning, understanding, and progress throughout their clinical experience. The descriptive analysis showed that E-portfolios were time-consuming, and this finding is well documented in the literature.^{34,35} Students need to be introduced to E-portfolios at an early stage in their studies, and they need to be taught how to reflect

effectively on their learning.¹⁶ There is a great need for hands-on training before the use of E-portfolio.³² Challenges of using E-portfolios have a positive and significant relationship with future utilization of E-portfolios, since students perceive their use in the future is associated with more challenges, as indicated by both correlation and regression analyses.

The findings of our study proved that students' experiences, the way that E-portfolios support students' learning, and the challenges faced by students were factors significantly influencing E-portfolio acceptability and perceived future use. However, the literature suggested that the challenges experienced during the implementation of E-portfolios would decrease with use.³² Thus, introducing E-portfolios early during programs might reduce the challenges and increase acceptance. Moreover, it will enhance students' learning.¹⁶ Continuous evaluation of the E-portfolio contents, execution, and experience are major

Table 2: Correlation analysis of the students' responses in this study (n = 66).

Variable	Future utilization	E-portfolio experience	E-portfolio learning	Challenges
Future utilization	Pearson Correlation Sig. (2-tailed)	1		
E-portfolio experience	Pearson Correlation Sig. (2-tailed)	-0.515** 0.000	1	
E-portfolio learning	Pearson Correlation Sig. (2-tailed)	-0.394** 0.001	0.814** 0.000	1
Challenges	Pearson Correlation Sig. (2-tailed)	0.371** 0.002	-0.285** 0.020	-0.319** 0.009

**Correlation is significant at the 0.05 level (2-tailed).

Table 3: Regression analysis of the students' responses in this study (n = 66).

Variable	Coefficient	Std. Error	T stat.	Sig. (p-value)
Constant	2.19	0.94	2.32	0.02**
E-portfolio experience	-0.86	0.29	-2.94	0.01**
E-portfolio learning	0.13	0.29	0.46	0.65
Challenges	0.29	0.11	2.64	0.01**

$R^2 = 0.372$; F statistics = 9.05 (P-value = 0.00); **Correlation is significant at the 0.05 level (2-tailed).

factors in enhancing the implementation of E-portfolios in learning and professional development.³⁶

In radiography, there is existing necessity for students and professionals to demonstrate continuous development. The use of E-portfolios in undergraduate education and beyond might play a pivotal role in demonstrating the development of learning. The current study concluded that students had a negative experience using E-portfolios, with the highest magnitude being challenges. Students benefited from the E-portfolio, but learning was not significant. Students need training workshops and continuous technical support to ensure proper implementation of E-portfolios. Moreover, it is important how the ideology of E-portfolios is introduced, supported, implemented, and made visible to students so they can relate it to their everyday learning and accomplishments. The current study showed that there was learning, but the challenges were more significant. To achieve long-term implementation, there is a need to encourage students and faculty to think of E-portfolios as a catalyst for active and lifelong learning. Particularly, there is need to train students and faculty members on how to integrate E-portfolios into teaching and learning.

Conclusion

This study revealed that students had a negative experience that affected their future use of E-portfolios, as there was a negative relationship between students' experience and future utilization in both the correlation test and regression analysis. Students' learning was negatively associated with the use of E-portfolios in their next clinical work, since there was a negative relationship between support to students' learning and future utilization of E-portfolios in both correlation tests, but the regression test proved that students had a positive relationship between E-portfolio learning and future utilization of E-portfolios. Challenges of using E-portfolios have a positive and significant relationship with future utilization of E-portfolios, since students perceive that using them in the future is associated with more challenges for them in both the correlation test and regression analysis.

Study limitations

The strength of this study is that it provides evidence of factors influencing E-portfolio acceptability and their impact on students' learning. Another important strength of this study is that all respondents had completed their E-

portfolios, and their responses were based on actual experience and not only on their perceptions. However, the study has some limitations. The sample consisted of undergraduate students who had been using E-portfolios for one academic year only. Personal factors such as motivations and personal capacities were not explored in the study, which might influence students' experience. Demographics were not included, which could have given us an idea about gender differences and how people of different genders manage and organize their time and tasks. Ethnicity and previous elementary education system could have also helped to categorize and explore the differences between students.

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Conflict of interest

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval was obtained from the Research Ethics Committee of the University of Sharjah.

Authors' contributions

All authors have directly participated in the planning, execution, and analysis of this study. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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