

Multimedia in Education: Readiness, Expertise and Multimedia Needs in Education

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Abstract

This research aimed to explore the readiness, expertise, and multimedia needs in education. An online questionnaire was used to collect data. A total of 124 students from the Faculty of Industrial Education responded to the survey. The data showed that most students have notebooks and smart phones as important tools for creating multimedia. The results showed that students have expertise and multimedia needs in education. Overall, there was a median level of expertise and the highest level of needs in multimedia for learning. This research contributes to the ongoing dialogue on multimedia integration in education by providing insights into educators' readiness, expertise, and multimedia needs. By understanding and addressing these factors, stakeholders can work towards harnessing the full potential of multimedia technology to enhance teaching and learning experiences in educational settings.

Keywords: multimedia, multimedia in education, teaching and learning, educational technology

1. Introduction

Technology and trends in education are changing rapidly. Multimedia plays an increasingly important role in education by understanding the learning process and making it more productive (Aguilar-Trujillo & Morón-Domínguez, 1994; Friedland et al., n.d.). Traditional teaching methods have been affected by changing technology, which is moving in a better direction. The Faculty of Industrial Education, which is the researchers' workplace, is responsible for training students to become future teachers. Students want not only multimedia access, but they also want to learn how to build it.

This research aimed to explore the urgent needs of students in the Faculty of Industrial Education who wanted to specialise in multimedia creation. It recognises the transformative potential to create a perfectly engaging and effective learning environment. Multimedia integration has been thoroughly studied in this research, with several researchers identifying a positive impact on its development (Clark & Mayer, 2016). Multimedia, containing text, images, sounds, animations, videos, (Abdulrahman et al., 2020; Deineko et al., 2022a; Sartono, Ambarsari, & Herwin, 2022) and elements can create diverse learning environments and stimulate an understanding of complex concepts.

The current educational landscape requires contextual change. By providing teaching in addition to conventional teaching methods, and accepting multimedia as a tool to aid knowledge transfer, it will become easy for learners to access knowledge and a large number of professional resources and courses (Qin et al., 2022). Students who will become teachers in the future wanted to study how multimedia is used in the teaching and learning process, and in research (Abdulrahman et al., 2020). They found that barriers to the development of online learning materials or

systems include fear or resistance to change. This means that learning management in changing situations must be an important part of the development and use of multimedia tools to achieve the desired goals. This can be done as part of the transformation process and also increases teachers' confidence in using multimedia materials in teaching. However, for this combination to be effective students must have the necessary skills to create multimedia content. The research objective was to assess the current state of students' multimedia abilities, identify existing barriers, and explore the need to learn how to create educational multimedia for Faculty of Education students.

The researchers hoped to engage in an ongoing argument about innovation in education and enable future education students to take full advantage of multimedia for the benefit of their students.

1.1 Research Objective

This study aimed to explore the readiness, expertise, and multimedia needs in respect of educational multimedia.

1.2 Literature Review

The use of multimedia in education involves its application or participation in teaching and learning in the classroom by combining different types of media, which are computerised processes. Interactive multimedia, produced as teaching materials, has become popular and is used in self-training, teaching aids, or as supplementary materials and educational entertainment materials (Haz et al., 2020). According to the research, the expected direction of the use of multimedia technology in future training is to reform the education system in the world's leading countries. The priority for education reform is proper training. It takes the least of time and costs the least amount of money. An interesting area was found to be the use of multimedia technology in educational activities to create the design of virtual environments by digitising audiovisual information. Multimedia can be used in nursing and medical education, industrial education, and various other educational scenarios (Al-Zu'bi et al., 2021; Linet et al., 2023). The purpose of the application of educational multimedia in higher education institutions is to prepare students (Shunkov et al., 2022). At all levels of education, there is a need for learning through the use of multimedia materials to enable effective learning and improve academic achievement. Multimedia is constantly evolving, developing new methods and changing technologies. The following table shows synthesised elements from several studies, with the following results.

Table 1. The synthesis of multimedia elements

Multimedia elements	Researcher									
	(Mahajan, 2012)	(Stemler, 1997)	(Kuchai et al., 2022)	(Leow & Neo, 2014)	(Krishna et al., 2021)	(Sartono, Sekarwangi, & Herwin, 2022)	(Sartono, Ambasari, & Herwin, 2022)	(Deineko et al., 2022b)	(Vagg et al., 2020)	(Wannapiroon et al., 2023)
Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Image	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sound	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Animation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Video	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Metaverse									✓	✓
AR, VR									✓	
Interactive										✓

Table one above not only lists various elements, but also reflects the evolution of multimedia that has changed along with technology. Initially, multimedia usually consisted of basic elements such as text, audio, images, and movies. Later, presentation techniques were developed to be more engaging, such as animation. Nowadays, advanced digital technologies have pushed the boundaries of multimedia even further, especially with the integration of various elements with augmented reality (AR), virtual reality (VR), and 3D technologies, which create more realistic and interactive learning experiences.

2. Scope of Research

2.1 Population

The research population comprised students of the Bachelor of Industrial Education Program, Faculty of Industrial Education currently studying computer engineering, mechanical engineering, industrial engineering, and technical education who are observing teaching, teaching experiments, and undertaking teaching experience in semester 2/2023.

2.2 Sample Group

The sample group consisted of students of the Bachelor of Industrial Education Program, Faculty of Industrial Education studying computer engineering, mechanical engineering, industrial engineering, and technical education who are observing, experimenting with teaching, and undergoing teaching experience in Semester 2/2023. The data was obtained from a random sampling of 124 students who were asked to answer an online survey.

3. Research Design

This is a descriptive study that was designed to collect data pertaining to the knowledge and skills of students of the Faculty of Industrial Education (teacher students) about their use of multimedia learning aids to assist their educational learning. This study aimed to explore their readiness, expertise, and multimedia needs.

4. Research Methods

The research process began by interviewing people involved in the creation of multimedia for education. This was followed by examining relevant research on the need for multimedia for education and designing content for the development of educational multimedia materials. Finally, the researchers investigated the development of multimedia for education. The sequence is displayed in the following diagram.

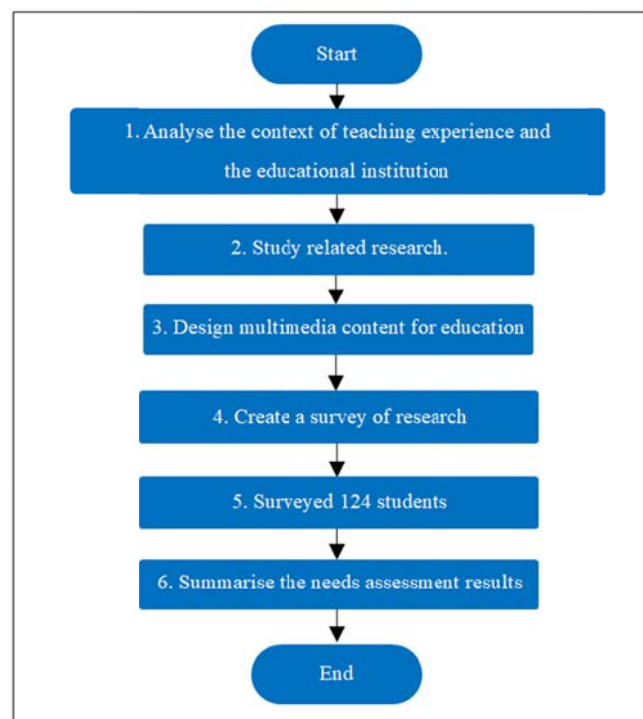


Figure 1. Research process

Figure 1 also shows some additional information about the needs assessment.

- 1) Analyse the context of teaching experience and the educational institution: This step focused on understanding the current teaching context, including the teaching methods used, the technology available, and the needs of the students. This information was gathered by reviewing literature, interviewing teachers, and surveying students.
- 2) Study related research: The researchers studied related research from books, journals, websites, and other

sources, focusing on keywords including multimedia, multimedia in education, teaching and learning, educational technology. Research investigating the need for multimedia in education at various grade levels and in different subjects has found that multimedia is an effective medium for delivering information to recipients. Children and adolescents are more interested in and value images, symbols, and videos over text (Buckingham, 2007). This is consistent with research that states that multimedia is a medium that facilitates and motivates learners to be more interactive, effective, efficient, and interested (Rahmat et al., 2023). Contrary to traditional teaching methods, it provides learners with a new learning experience with a better understanding of concepts (Lau et al., 2014).

3) Design multimedia content for education: Once the teaching context was understood, the next step was to design appropriate multimedia content. This content should be engaging, interesting, and meet the needs of the students. Examples of multimedia content include videos, infographics, games, and simulations.

4) Create a research survey: The researchers developed a survey of the participants' readiness, expertise, and multimedia needs in educational multimedia.

Table 2. Learning topics of multimedia in education

No.	Topic	Knowledge	Skill	Attitude
1	Importance of multimedia for education	✓		
2	Multimedia development process	✓		
3	Using colour in multimedia	✓		
4	Where to download resources for creating multimedia work	✓		
5	Production of presentation media for teaching		✓	
6	Infographic design		✓	
7	Production of video media for distance learning		✓	
8	Creative publicity posters for education		✓	
9	Creating an educational metaverse		✓	
10	Copyright in multimedia works	✓		✓
11	Application of media in the classroom	✓		

5) Survey of 124 students: The survey was designed to evaluate the availability of tools for multimedia production. This step focused on evaluating the readiness, expertise, and multimedia needs in educational multimedia, including software and hardware used to create educational multimedia.

6) Summarise the needs assessment results: The final step was to summarise the results of the needs assessment. This information enabled the researchers to design multimedia content that meets the needs of the students.

5. Result

Findings from this research shed light on educators' readiness and expertise in using multimedia tools and their specific needs and preferences regarding multimedia resources and training programmes. The research results can be divided into four topics: 1) general information about the survey respondents, 2) readiness of students to create multimedia for education, 3) expertise in using tools for multimedia design, and 4) the students' expertise in multimedia creation and the need for learning materials in multimedia creation.

5.1 General Information about Survey Respondents

There were a total of 124 respondents to the online survey. General information collected by the research team from the survey respondents included gender, course of study, teaching experience status, and the education level of the school where they are currently undergoing or preparing for teaching practice. The results can be summarised as follows:

5.1.1 Gender of survey respondents

A total of 153 students responded to the survey, of whom 40% were men and 60% were women.

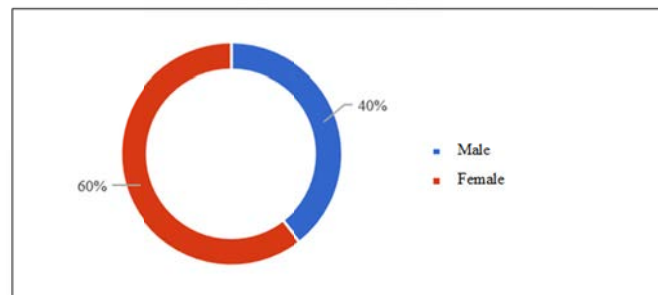


Figure 2. Gender of survey respondents

5.1.2 Curriculum of Survey Respondents

The students who responded to the survey were studying in the Faculty of Industrial Education, and following four courses, namely mechanical engineering, computer engineering, industrial engineering, and the professional teaching certificate. The proportions are shown in the following diagram.

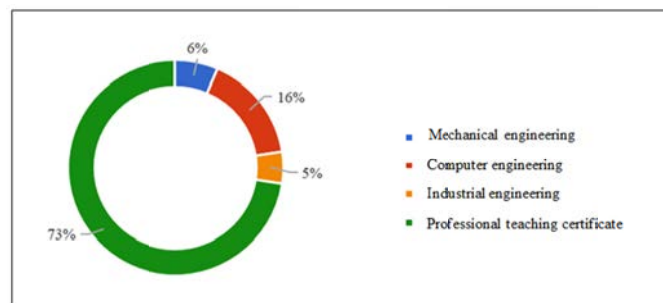


Figure 3. Curriculum of survey respondents

5.1.3 Status of Teaching Practicum

The statuses of those who responded to the survey were: preparation for teaching practicum (preparation before observing teaching), observing teaching (before teaching practicum in school), and undergoing teaching practicum at school for one year. The proportion of respondents in each status was as follows.

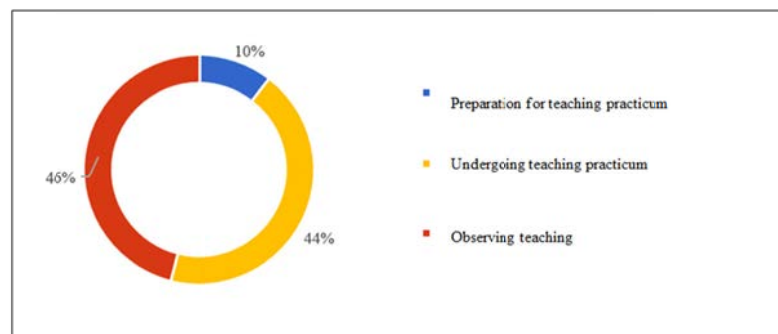


Figure 4. Status of survey respondents

5.1.4 Educational level of teaching practicum locations

The students who responded to the survey were divided into those participating in primary education, primary and secondary education, secondary education, vocational education, and other. The proportion of respondents in each level was as follows.

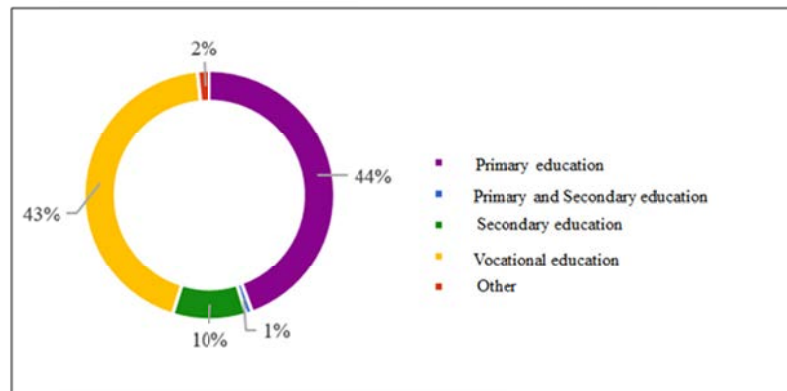


Figure 5. Level of education locations of survey respondents

5.1.5 The readiness of students to create multimedia for education

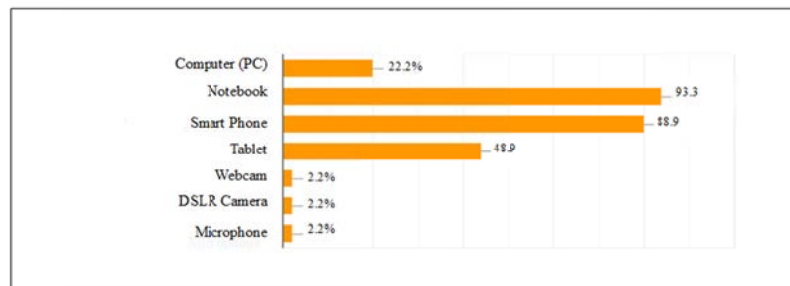


Figure 6. Readiness of students to create multimedia for education

Figure 6 above indicates a high level of student readiness for creating educational multimedia. The most commonly used devices are notebooks (93.3%), followed by smartphones (88.9%), and tablets (48.9%).

5.2 Readiness and Expertise in Using Tools for Multimedia Design

Figure 7 presents a bar graph comparing the average levels of readiness and expertise in using various multimedia design tools. The results are as follows.

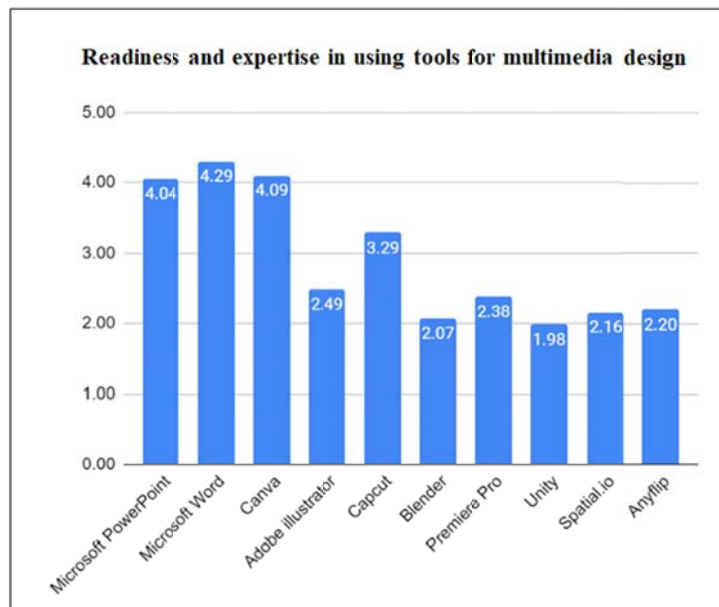


Figure 7. Readiness and expertise in using tools for multimedia design

The vertical axis represents the numerical values indicating the level of readiness and expertise, ranging from one to five, with five being the highest score. The bars represent the average scores for both readiness and expertise for each multimedia design tool. All average scores fell within the four range, indicating that users generally have a high level of readiness and some degree of expertise in using these tools. This graph displays the average scores of a sample population and does not represent individual skill levels. It suggests that the surveyed group exhibits a readiness and some level of expertise in using various multimedia design tools. The level of expertise may vary for each specific tool and there may still be room for further skill development. Overall, this graph suggests that users have a moderate level of readiness and expertise in using multimedia design tools.

5.3 The Students' Expertise in Multimedia Creation and the Need for Learning Materials in Multimedia Creation

The chart in Figure 8 shows that students have a lower perceived need for learning materials in areas where they have a higher perceived expertise in multimedia creation. The expertise was rated on a five-point scale, with five being the highest level of expertise. The need for multimedia learning tools in education was also rated on a five-point scale, with five indicating the greatest need for tools.

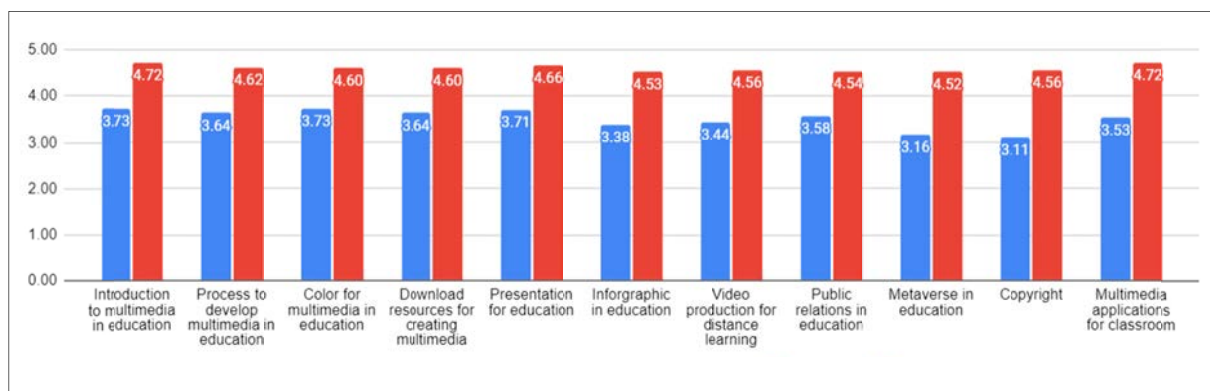


Figure 8. The chart compares students' expertise in multimedia creation and the need for learning materials in multimedia creation

Table 3. Comparison of students' expertise in multimedia creation and the need for learning materials in multimedia creation

No.	Assessment Topics	Assessment Result					
		\bar{x}	S.D.	Multimedia expertise	\bar{x}	S.D.	Multimedia needs in education
1	Importance of multimedia for education	3.73	0.84	high level	4.73	0.51	highest level
2	Multimedia development process	3.64	0.83	high level	4.63	0.53	highest level
3	Using colour in multimedia	3.73	0.84	high level	4.63	0.55	highest level
4	Where to download resources for creating multimedia work	3.64	0.86	high level	4.62	0.58	highest level
5	Production of presentation media for teaching	3.71	0.84	high level	4.68	0.54	highest level
6	Infographic design	3.38	1.09	medium level	4.53	0.65	highest level
7	Production of video media for distance learning	3.44	1.01	medium level	4.58	0.63	highest level
8	Creative publicity posters for education	3.58	0.89	high level	4.56	0.61	highest level
9	Creating an educational metaverse	3.16	1.26	medium level	4.53	0.69	highest level
10	Copyright in multimedia works	3.11	1.27	medium level	4.57	0.63	highest level
11	Application of media in the classroom	3.53	0.92	high level	4.73	0.48	highest level
	Overall	3.51	0.97	high level	4.62	0.58	highest level

According to the survey results, the surveyed students have both expertise and multimedia needs. Overall, there was the high level of expertise ($\bar{x} = 3.51$, S.D. = 0.97) and the highest level of needs in multimedia for learning ($\bar{x} = 4.62$, S.D. = 0.58).

- High Expertise, Low Need: Students reported the highest expertise (around 4.7) in creating presentations and infographics, and the lowest need for learning materials (around 3.3) in those areas.
- Medium Expertise, Medium Need: In areas such as video production and using colour in multimedia, students reported a moderate level of expertise (around 4.5) and a moderate need for learning materials (around 3.5).
- Low Expertise, High Need: Students reported the lowest expertise (around 3.1) in areas such as copyright and the metaverse in education, and the highest need for learning materials (around 4.7) in those areas.

6. Discussion

When the results of the research were ranked according to needs, it was found that there is a need to promote the learning management abilities of teachers who want to develop their ability to innovate and apply technology that is beneficial to learners. This may be due to the rapid transformation of innovative media and educational technology. As a result, students have to adapt to prepare themselves with knowledge, skills, and abilities to produce multimedia materials for teaching and in order for learning to be interesting and effective.

Findings from this research shed light on educators' readiness and expertise in using multimedia tools and their specific needs and preferences regarding multimedia resources and training programmes. This information will be valuable for educational policy makers, course developers, and professional development providers to design effective strategies to support educators in integrating multimedia into their teaching approaches.

Upon ranking the results of this research according to the needs identified, it was found that there is a significant requirement to enhance the learning management capabilities of teachers, particularly in developing their ability to innovate and apply technology that benefits student learning. This need arises from the rapid evolution of innovative media and educational technology, necessitating that students adapt and be equipped with the knowledge, skills, and abilities to create engaging and effective multimedia teaching materials.

The findings of this research illuminate the readiness and proficiency of educators in utilising multimedia tools, as well as their specific needs and preferences regarding multimedia resources and training programmes. This information is invaluable for educational policymakers, course developers, and professional development providers in devising effective strategies to support educators in the integration of multimedia into their instructional methods.

7. Conclusion

The research findings suggest that students feel more confident in creating multimedia content in areas where they have more experience or prior exposure. Conversely, they feel the need for more learning materials in areas where

they have less experience or exposure. It is important to note that this study had a limited sample size of only 124 students and may not fully reflect the experiences of all students. However, it emphasises the benefits of providing targeted learning tools tailored to students' specific needs and areas of expertise.

The research aimed to contribute to the ongoing discourse on multimedia integration in education by providing in-depth insights into educators' readiness, expertise, and multimedia requirements. The limitations of the study, including the small sample size and lack of diversity in the population covered, open opportunities for future research to expand sample sizes, study more diverse student groups, and explore effective learning materials to enhance multimedia integration in educational systems.

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Authors contributions

Dr. Siwaporn Linthaluek led the development of the research framework, designed the research methodology, conducted data analysis, constructed the research model, contributed to the discussion of findings, and conducted a comprehensive review of the manuscript. Dr. Rattanaporn Chanthra and Dr. Phuchit Satitpong contributed to the design of the research methodology and were actively involved in data collection. Assist. Prof. Dr. Natt Siri wattananon and Assist. Prof. Dr. Bunthida Chunngam provided guidance and oversight throughout all phases of the research process. All authors reviewed and approved the final version of the manuscript. All authors contributed equally to this work.

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Obtained.

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Data sharing statement

No additional data are available.

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